

A woman in a laboratory setting, viewed from behind, working with scientific equipment. The image is overlaid with a semi-transparent green filter. She is wearing a white lab coat and a hairnet. In the background, there is a piece of scientific equipment with several glass vials or test tubes on a tray.

LADIES IN THE LABORATORY III

South African, Australian, New Zealand,
and Canadian Women in Science

Nineteenth and Early Twentieth Centuries

A Survey of Their Contributions

MARY R. S. CREESE
WITH THOMAS M. CREESE

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New Zealand, and Canadian Women
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Any errors are my responsibility.

Introduction

Science-related contributions of nineteenth-century women in South Africa, Australia, New Zealand, and Canada (four countries that were then part of the British colonial empire) are examined here. This study forms the third part of a wider survey of nineteenth- and early twentieth-century work by women in the sciences; part one concerned British and American women, and part two focused on continental western Europeans, plus women in Ireland.¹ A total of twenty-six women from the four colonial countries published papers in journals that the London Royal Society considered sufficiently important to index in its *Catalogue*.² Most were written by Australians and Canadians, and about three-quarters dealt with topics in the biological sciences (figure I.1).

The initial criterion used to decide who should be discussed in the survey has to a considerable extent been set aside in this third part. As well as the women whose research reports were indexed in the Royal Society's *Catalogue*, many whose contributions came in other forms are included, among them botanical artists and collectors, sky watchers and other participants in astronomical work, and pioneering educationalists and physicians—most of whom had some science background. The link between scientific research and early educationalists and physicians might well be considered tenuous, but the somewhat more conservative and less-developed societies in which the colonial women lived were significantly different from those of their contemporaries in western Europe and the United States. Before 1900, the opportunities of colonial women for original work were even more restricted than those of the Europeans, and their career options were few. They made their contributions where they could, most notably in the areas of plant collecting and botanical illustration; as is tacitly acknowledged by the inclusion of botanical artists and collectors in such works as Ray Desmond's *British and Irish Botanists . . .* (1977, 1994), the activities of these workers were not unimportant in exploring and reporting the natural history of recently settled lands. In women's education and health care, the work of late nineteenth-century pioneers, the first of the university graduates, contributed much to furthering the chances of the next generation to participate more fully in the sciences. Including selections from these groups better reflects the extent and significance of the contributions of late nineteenth-century colonial women.

The book is organized by country, each country having a separate chapter. With the exception of chapter 1, on South Africa, each consists of two major sections. The first examines the contributions of amateurs, mainly botanical artists, collectors, and independent naturalists, but includes shorter notes discussing women's activity in astronomical work; the second section looks at the contributions of university-trained women. Full biographical information is provided for many; others, about whom information is scant or not available at present, are mentioned only briefly. A bibliography of the women's pre-1900 papers extracted from the Royal Society *Catalogue* is included, with organization by country and within each country by area of activity.

Although the three Southern Hemisphere countries especially were distant from western centers of science and education, they were by no means cut off. Communication was slow and somewhat precarious, but nonetheless specimen collecting and pictorial representation for British and continental specialists and institutions were very much part of the inspiration and purpose of the work of the women pioneers. Their backgrounds varied greatly. A considerable number were wives of settlers who

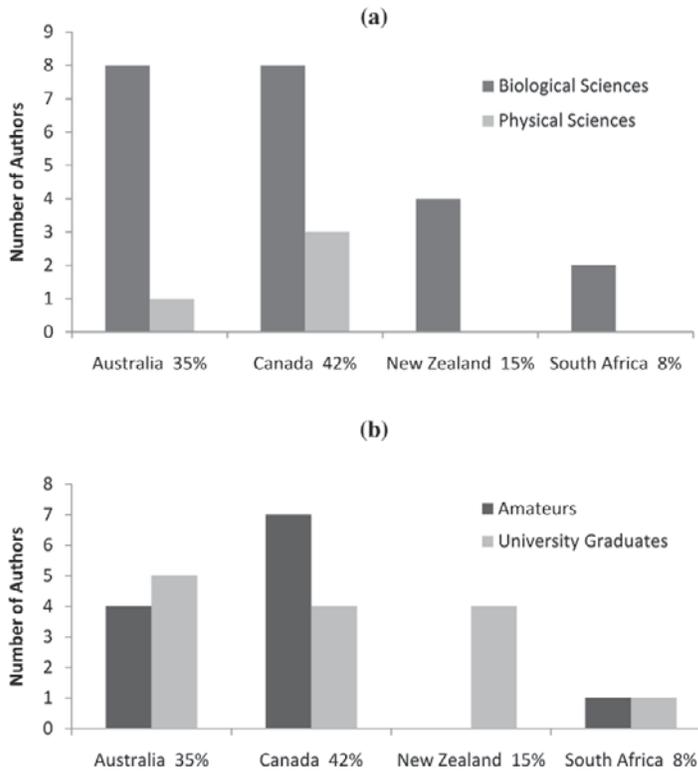


Figure 1.1. Distribution of authors, by country, 1800–1900: a) by general area of interest, and b) by amateur/university-graduate classification. Data from the Royal Society *Catalogue of Scientific Papers*.

were moving into rough, untouched lands; but in many cases these women came from British middle-class families for whom drawing and painting were part of a girl's education. Others were second-generation, the daughters of settlers who had done well in their new environments and become leaders in their growing and increasingly developed communities.

Many of the early settler women, plant collectors and floral artists, led lives filled with interest and adventure, as well as initial and sometimes prolonged hardship. Later women, the first of the university graduates, also rose to the special challenges they faced in their subsequent careers with remarkable enterprise, energy, and spirit. This work offers a selection of stories of many nineteenth- and early twentieth-century women active in regions well away from western centers. I hope it brings attention to and engenders interest in some neglected and largely forgotten artists and writers.

NOTES

1. For parts 1 and 2 of the survey, see Mary R. S. Creese, *Ladies in the Laboratory? American and British Women in Science, 1800–1900* (Lanham, Md.: Scarecrow Press, 1998) and *Ladies in the Laboratory II: West European Women in Science, 1800–1900* (Lanham, Md.: Scarecrow Press, 2004).

2. Royal Society, London, comp., *Catalogue of Scientific Papers, 1800–1900*, 19 vols. (Cambridge, UK: Cambridge University Press, 1867–1925).

Chapter One

South Africa

Botanical Wonderland

The Royal Society *Catalogue* lists pre-1901 scientific papers by only two women working in South Africa: naturalist Mary Elizabeth Barber, née Bowker, and botanist Bertha Stoneman. This is perhaps fewer than might have been expected, considering South Africa's relatively long period of European settlement compared to Australia and New Zealand, and its impressively long record of work in both natural history and the astronomical and navigational sciences. However, many women in South Africa made important contributions well before 1900, particularly as plant collectors and botanical artists. The careers of a few of them have been included here, in spite of their absence from the Royal Society's lists.

By the late fifteenth century, establishing an alternative route by sea to the Far East was becoming increasingly important for Europeans, and maintaining commerce between the Mediterranean region and the Orient via the ancient overland Silk Road, which skirted the vast deserts and mountains of central Asia, had grown more and more difficult. The first demonstration of the existence of a possible sea route came with the voyages of the late fifteenth-century Portuguese navigators Bartholomeu Dias and Vasco da Gama. However, the great length and arduous nature of the voyage meant that watering stops were essential, and the southern tip of Africa was one obvious location. Navigators from other western nations followed the Portuguese, especially the Dutch, French, and English. The first English ships landed at the Cape of Good Hope (figure 1.1) in 1591, and reports were brought back of good land and useful plants. By the seventeenth century, the Dutch East India Company was directing its captains to collect plants at stops along their routes to and from the Far East, and by 1652 they had established a watering spot and staging point at Table Bay for their ships bound for the East Indies.

Thus the earliest botanical investigations of the region were carried out by the Dutch, and the first references to South African plants in European literature date from their work in the early years of the seventeenth century.¹ Introductions of new plants of entirely unknown types from the incomparable floral wealth of the Cape transformed the appearance of both private and public gardens in Holland and in other European countries over the course of the late seventeenth and early eighteenth centuries; early nursery catalogs and garden books in England, France, and Italy, as well as in the Netherlands, included bulbs and many other exotics from South Africa. Further, South African plants, a great variety of which were brought back for Carolus Linnaeus and his students, were a significant part of his mid-eighteenth-century studies that led to the systematic development and expansion of botany and its recognition as a full science.

A vitally important part of the permanent settlement that the Dutch fairly quickly established at their Table Bay watering spot was the company garden. This supplied ships' crews with fresh vegetables, the only preventive measure then known against scurvy, the serious disease that afflicted sailors on long voyages. The company's gardeners and administrators not only explored the floral wealth of the Cape, particularly that of the immediate hinterland of Table Bay,² but over time developed a real botanic garden at their settlement.

By the 1680s new settlers, including Huguenots and many from Holland and Germany, were pushing inland from the coast, starting a movement that continued into the eighteenth century, when ivory

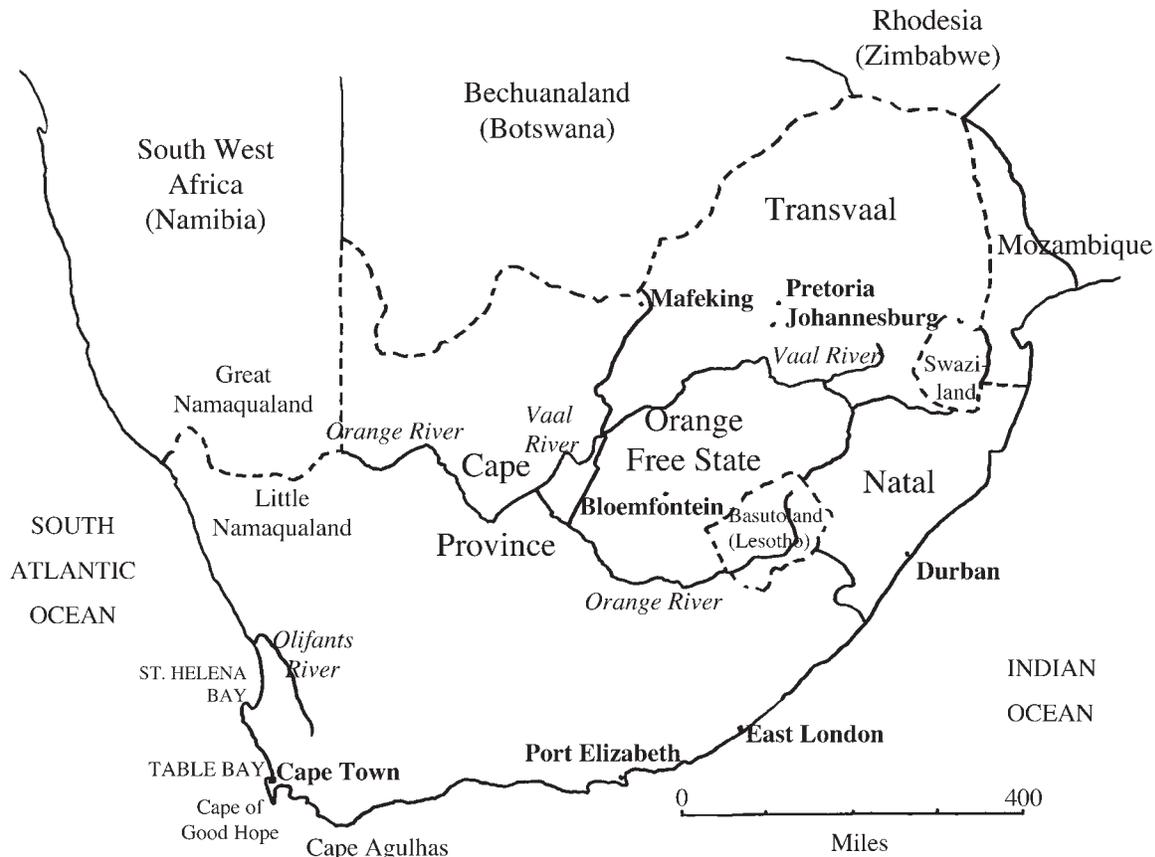


Figure 1.1. South Africa: Cape Province, Orange Free State, Natal, and Transvaal.

hunters may have penetrated as far as Natal. In their footsteps a few years later came Swedish, German, and English botanists who began the systematic exploration of the region. Greatly stimulated by the publication of popular travel books, general public interest in the Cape and its exotic flora and fauna was on the rise in Europe. Numerous visitors and temporary residents, as well as settlers, were not slow to present their discoveries, quite often in the form of sketches and pictures.

BOTANICAL ARTISTS AND COLLECTORS

Before 1800

In part to emphasize the early entrance of women into botany-related activity in South Africa, two pre-1800 participants are included here: Lady Anne Monson and Lady Anna Maria Barrow.

LADY ANNE MONSON,³ née VANE (c. 1727–1776), was born in England. The eldest daughter of Henry Vane, first Earl of Darlington, and his wife, Lady Grace Fitzroy, she was through her mother a great-granddaughter of Charles II. Well educated, she learned several modern languages and acquired a working knowledge of Latin. Her first marriage, to Charles Hope-Vere, a son of the Earl of Hopetown and a Scottish member of parliament, ended in dissolution in 1757 after eleven years. She then married Colonel George Monson of Lincolnshire, third son of John Monson, first Baron Monson. Since Monson, a career army officer, served for many years in India, latterly as a member of the Bengal supreme council, much of Lady Anne's life after her second marriage was spent in Calcutta.

Long interested in natural history and a friend and correspondent of Linnaeus, by 1760 she was also well acquainted with British nurseryman James Lee. It seems likely that she assisted Lee anonymously in preparing a translation of Linnaeus's *Philosophia Botanica* (1760) for English readers. On her way

to Calcutta in 1774 she spent some time at the Cape, where she met botanist and physician Carl Peter Thunberg, perhaps Linnaeus's most distinguished student. Thunberg had accepted a post with the Dutch East India Company and, en route to Japan, spent two years in South Africa, where he made extensive expeditions studying and collecting local flora. Well acquainted with the area, he was able to guide Lady Anne on several journeys to visit farms throughout the colony, trips from which her already substantial collections benefited richly. A draftsman whom she brought with her helped in collecting and delineating rare specimens.

Lady Anne Monson died in Calcutta on 18 February 1776, when she was about fifty. She had been a prominent and popular figure in the city's Anglo-Indian community, although her husband's strong opposition to the policies of Warren Hastings, governor-general of Bengal, made her last years very difficult. The South African flowering shrub genus *Monsonia* was named after her by Linnaeus, to whom she also sent Indian plants. Her collection of Bengal insects was given to James Lee's daughter Ann.

Possibly the earliest woman born in the Cape whose contributions to South African botanical studies are still preserved was LADY ANNA MARIA BARROW,⁴ née TRÜTER (1777–1857), the third child and only daughter of government official Petrus Johannes Trüter. In 1799, at Stellenbosch, about twenty-five miles east of Cape Town, she married John Barrow (Sir John Barrow from 1835), then auditor general to Cape Colony.

A good amateur naturalist, friend of Sir Joseph Banks, and a fellow of the Royal Society, John Barrow was well informed on Cape plants, especially trees; he traveled extensively throughout the colony and produced a map of the region better than anything previously available. Anna Maria, a skilled artist, painted landscapes and flowers. A folio album of her Cape scenes is held in the Museum Africa (formerly the Africana Museum), Johannesburg, and the library at the Botanical Research Institute, Pretoria, has an album of her Cape flower studies.

Although the Barrows had intended to settle in the Cape, they returned to Britain when the administration of the colony (in British hands from 1795) passed back to the Netherlands in 1803.⁵ Barrow served as second secretary to the Admiralty from 1804 until 1845. Lady Anna died in England in 1857. She had at least two sons, one of whom, John Barrow, went on to a notable career in the Admiralty and as an author.

Nineteenth- and Early Twentieth-Century Artists and Collectors

Artists whose drawings and paintings illustrate major botanical works hold an important place in the history of botany, and many of those who have contributed to this field are women.⁶ Sketches of six women naturalists and botanical artists associated with noteworthy collections and major portfolios of studies of the rich South African flora are included here: Arabella Roupell, Katharine Saunders, Mari- anne Fannin, Florence Phillips, Mrs. M. Crossman, and Ethel May Dixie.

ARABELLA ELIZABETH ROUPELL,⁷ née PIGOTT (1817–1914), was born in Newport, Shropshire, on 23 March 1817, the fourth of five daughters among the twelve children in the family of Rev. John Dryden Pigott, rector and squire of Edgmond, Shropshire; her mother, Frances, was the second daughter and coheir of Henry Bevan. Rev. Pigott, who later inherited Sundorne Castle, Shropshire, had considerable financial resources.

Arabella was most likely educated at home and, like many young ladies of her time, was well schooled in drawing and painting. In 1840, at age twenty-three, she married Thomas Boone Roupell (1809–1889), an official in the East India Company at Madras, then on furlough in England. The Roupells sailed for Madras soon after their marriage, but about two years later, following the birth of their son Norton, the eldest of their six surviving children, Thomas Roupell was granted a year of service leave at the Cape; the family hoped that the milder climate there would alleviate Arabella's health difficulties.

Her botanical painting began shortly after her arrival in India, and a number of works inscribed and dated "Madras, 1841" have survived. At the Cape she continued the pastime. Amateur botanizing was a popular recreation among the ladies of the Cape in those early days, but Arabella Roupell's work was especially notable. Very soon it caught the attention of another temporary resident, Danish physician and botanist Nathaniel Wallich. One of several botanists then at the Cape, Wallich was on leave from

his post of superintendent of the East India Company's botanic gardens at Calcutta. He encouraged Arabella and, having the botanical knowledge she lacked, acted as her "scientific advisor," accompanying her on collecting expeditions to the surrounding countryside and identifying the various species she painted. A close friend of Sir Thomas Maclear, astronomer royal at the Cape Observatory from 1833 to 1870, Wallich introduced the Roupell and Maclear families, a meeting that led to a lasting friendship between Arabella Roupell and Lady Mary Maclear, already an admirer of Arabella's work. Other scientific contacts she had at the Cape included botanist Baron von Ludwig, developer of a botanical garden in Cape Town, and James Bowie, a plant collector from Kew who spent many years at the Cape.

After the Roupells returned to Madras in 1845, Arabella continued her flower painting, eventually building up a collection of ninety-one watercolors of the native flora of the subcontinent. She wrote that she painted "solely for the amusement of leisure hours,"⁸ but on his retirement to London from Calcutta in 1846, Wallich succeeded in persuading her to let him take a selection of her paintings to show to the director of Kew Gardens, Sir William Hooker. Impressed by their accuracy and artistic merit, Hooker, together with Arabella's botanist brother-in-law Dr. George Roupell, selected ten drawings for publication; the planned tailpiece of the work was a reproduction of *RouPELLIA grata* (*Strophanus gratus* of the Apocynaceae family), an evergreen flowering climber indigenous to Sierra Leone, named after Dr. Roupell. Lithographs were prepared by Paris-based Massimo Gauci, a Maltese artist well known for his high-quality work, and descriptions of the plates were written by William Harvey, then curator of the herbarium at Trinity College, Dublin, author of the standard work *The Genera of South African Plants*.⁹ Dedicated to Wallich, *Specimens of the Flora of South Africa* was published as an atlas folio in a limited edition of most likely 110 copies, there being 110 subscribers; it is now a highly valued collector's item.¹⁰

Arabella Roupell's skill as a botanical artist was recognized not only in Britain but on the Continent as well. Elected a member of the Regensburg Society of Arts, she was also honored by the eminent Basel botanist Carl Friedrich Meissner (1800–1874), who in 1857 gave the name *rouPELLIAE*, after her, to a species of the South African Protea. Sir William Hooker, in his *Journal of Botany* review of *Specimens of the Flora of South Africa*, praised the work highly: "As a specimen of Art, we may observe that the subjects are the most choice that a South African vegetation (celebrated for its variety and charms) can Exhibit. . . . The title page is a picture in itself—a wreath, tastefully enclosing the engraved title, of the most charming kinds of Amaryllidaceous, Irideous and Orchideous plants, *Oxalis*, etc." He went on to note that the work gave Harvey the opportunity to present informative discussions of the characteristics of these plants, some of the most distinctive and beautiful in southern Africa.¹¹

Following the formal dissolution of the East India Company in 1858 Thomas Roupell retired, and the family returned to Britain a year later. By then the Roupells had fairly adequate means, Thomas having been promoted nine years previously to posts of civil and sessions judge first at Coimbatore and then at Cuddalore (both cities in southern India). They purchased a small estate, Loddar Court in Reading, Berkshire, where Arabella took up landscape gardening and continued her painting. Part of the year she spent at Sundorne Castle, her father's inheritance in Shropshire. She died in her ninety-eighth year, just before the outbreak of the First World War, at Loddar Court, on 30 July 1914, having survived her husband by a quarter of a century.

For twenty years after her death Arabella Roupell's paintings were forgotten, but in the 1930s botanist Mary Gunn of Pretoria traced them with the help of Elizabeth Chute Roupell, wife of Arabella's son Norton. Initially the original paintings of both Cape and Indian flowers were in the possession of Arabella's grandson, who in 1950 bequeathed the collection to Field Marshal Jan Smuts, also a keen botanist. After the field marshal's death, the Smuts family presented the paintings to the University of Cape Town, of which he had been chancellor. An additional painting, showing a species of Cape heath, which had been given by Arabella Roupell to Lady D'Urban, wife of a former Cape governor, Sir Benjamin D'Urban, is now in the Museum Africa, Johannesburg.

KATHARINE SAUNDERS,¹² née WHEELWRIGHT (1824–1901), was born on 28 July 1824 in Northamptonshire, the sixth of seven children of Canon Charles Apthorp Wheelwright of Tansor, Northamptonshire, and his wife, Anna. Katharine grew up in the vast, stone-built, Tudor-style rectory in Tansor where her father was rector. The Wheelwrights are thought to have been a tightly knit family, with the children all taking part in the religious activities of their father's parish. Katharine studied music from

age five and was painting in watercolors by age six, her usual subjects being flowers. At nineteen she went to the Continent to study languages and drawing. Although she had help in this venture from her older brother Horatio, a naturalist, traveler, and writer, her move was a bold and unconventional one for a young lady in the early 1840s. Perhaps something of her confident and enterprising spirit came from her royal Plantagenet genes, her father being descended in a direct line from that dynasty. She also had an older sister, Anna, in Dusseldorf, where she had lived since being banished in disgrace after allowing herself to be seduced; Anna Wheelwright supported herself and her child by painting decorative pictures, especially flowers. Katharine spent seven years on the Continent, becoming proficient in drawing and fluent in French, German, and Flemish. In 1850, during a visit to Dusseldorf, she met James Renault Saunders. Born in Mauritius, James belonged to a trading family that had operated successfully on the island until the early 1830s. He and Katharine were married in the British Embassy, Brussels, in 1851. Three years later James Saunders, not finding satisfactory career possibilities in England, accepted a job as business manager and partner in the recently formed Natal Company; the company's founders, a syndicate of London and Cape Town businessmen, had acquired one hundred thousand acres in the Natal colony, a region over which Britain had established sovereignty only eleven years previously. The young Saunders family, which now included a daughter, sailed from Portsmouth in the full-rigged East Indiaman *Hotspur*, arriving at Cape Town in September 1854 after fifty-four days at sea. Three weeks later they went on to Durban on the coastal mail service steamer *SS Natal*, and after a preliminary trip inland to Natal's capital, Pietermaritzburg, where they introduced themselves to the colony's leaders and administrators, they completed their journey to the Chiappini Sugar Estates at Tongaat (figure 1.2). The twenty-mile trip by oxcart north from Durban with their luggage—which included a grand piano—took three days.

Within a year of her arrival at the Tongaat estate, then a vast expanse of scrub with a belt of tropical jungle along the coast, Katharine Saunders started painting flowers and cultivating her own garden. Her first Natal home, "The House by the Drift," was a rambling, thatched structure with shady verandas built on a promontory overlooking the Tongaat River.

Her interest in native South African plants was stimulated by Mark Johnston McKen, a fiery Scotsman who had been engaged in 1853 by Cape Town merchant and Natal Company partner Edward Lorenzo Chiappini to develop his Tongaat landholding and start a sugarcane plantation. A pioneer in the colony's sugar industry, McKen had received some horticultural training in Britain before going to the West Indies, where he acquired considerable experience in sugar production. In 1851 he had been appointed curator of the recently established but poorly funded Durban Botanic Garden; two years later he accepted a position at Chiappini's Tongaat estate, where he stayed until resuming his Botanic Garden curatorship in 1860. One of Natal's outstanding early botanists and perhaps the most active and effective of the region's early botanical collectors, McKen as curator established an important program of plant exchanges with nurserymen and botanists in Britain and other countries. During the five years Katharine Saunders knew him at Tongaat, McKen gave her valuable help and guidance in developing her botanical interests.¹³ Soon after she arrived, he established several Natal orchids on trees in her garden, starting her lifelong special interest in the group.

Katharine Saunders's aim was to paint as many native flowers as possible and to identify and record any unknown species she found. This led to a great deal of correspondence with botanist Harry Bolus in Cape Town (see the section below on Louisa Bolus), with the Hookers at Kew Gardens, and with William Harvey, then at the herbarium at Trinity College, Dublin, although he had earlier spent several years in the Cape.¹⁴ What began as requests by Saunders for help with identifications continued as an exchange of notes and information, duly acknowledged in print by the male botanists, who greatly appreciated her supplying them with many live specimens.

In 1860 James Saunders became the sole proprietor of the Tongaat estate,¹⁵ that being his share of the assets of the Natal Company when the latter fell into insuperable financial difficulties. By the 1870s the Saunders household, which now included several children and numerous servants, had moved to the sprawling, two-story Tongaat House, built by James on a healthy, hilltop position and surrounded by extensive grounds. Very involved in her plant collecting and painting, Katharine Saunders was by then becoming well known in botanical circles; Tongaat House, ideally positioned in the middle of a region populated by settler farmers among whom were several enthusiastic plantsmen, became the center of



Figure 1.2. Eastern South Africa.

much of Natal's pioneering botanical activity. The Saunders home was a convenient meeting place for north-coast botanists, and visits regularly included botanical forays to the surrounding countryside; much of the collecting in this early period of the colony's botanical activity was done within a radius of seventy-five miles of Tongaat. Although the work was undoubtedly initiated by Mark McKen, after he left the area in 1860 interest was maintained in large part by Katharine Saunders's enthusiasm, her dedication to conservation, and her eagerness to tell others about the beauty of Natal's flowers.

In 1881, leaving the estate in the charge of two of their sons, Katharine and James Saunders returned to England for a lengthy visit, which included a trip to the Continent and a tour of Wales. Katharine carried with her parcels of dried plants from Mark McKen and other Natal botanists for presentation to Joseph Hooker at Kew Gardens. In addition she brought material she had collected herself, dried plants collected by her son Charles, and sketches of seventy to eighty orchids. Her meetings at this time with

Joseph Hooker and his staff, including his successor William Thiselton-Dyer, led to an active correspondence between her and the Kew botanists, which went on until her death twenty years later.

Not long after her return to Tongaat in 1882, she had a visit from the well-known English traveler and flower painter Marianne North, who spent three weeks in Natal during her 1882–1883 visit to South Africa. Katharine also traveled extensively in the 1880s and 1890s within southern Africa, like North carrying her painting equipment with her wherever she went. A long trek in 1887 brought her to Swaziland and eastern Transvaal, some two hundred miles north of Tongaat, and two years later she went to Heidelberg in south-central Transvaal. In 1892 she visited her son Charles in Eshowe, about fifty miles north of Tongaat; 1893 and 1897 saw her in Johannesburg. These journeys over vast distances under difficult conditions required considerable courage and stamina from a woman in her sixties and seventies, but even after the turn of the century, in the last two years of her life, her traveling and sketching continued. Penciled notes on the backs of her flower studies indicate that her last paintings were done in 1901, a year in which she went to Halfway House and Botha's Hill, both on the way to Pietermaritzburg.

Although her main interest was plant illustration rather than collecting and building up a herbarium, the notes and comments she typically made below or on the backs of her paintings gave dates, localities where collected, and names of species; rough sketches of dissections and flower parts that were often included testify to her good knowledge of flower structure. If unable to identify a plant herself, she called on help from Cape Town or Kew botanists. Her folios were carefully arranged, her hope being to make her illustrations available to all those interested in local flora. The volume she presented to the Natal Museum in Pietermaritzburg in 1889 was meant to serve as a botanical reference work for the region. Her works contained illustrations of one or more species of nearly all the orders of Natal and Cape monocotyledons.

A considerable number of the species she painted or sent to Kew or Cape Town were supplied by her son Charles. Several of these were previously unknown; three were named after Charles and one after his first wife, Maud. Charles, later Sir Charles of the Natal civil service, a leader in efforts to establish the Zululand Game Reserves, was then resident magistrate in territory to the north of Durban; expeditions he led to determine boundaries for Tongaland and then for Zululand offered favorable opportunities for finding new species.

Of the 426 specimens Katharine Saunders sent to Kew between 1881 and 1889, about 16 are reported to have been named after her, some of them now reclassified. Examples include the shrub *Schrebera saundersiae* named after her by William Harvey in 1863, *Dermatobotrys saundersii*, described by Harry Bolus, and *Haemanthus katharinae*, a spectacular five-foot plant most of whose related species have bright red flowers and red fruits; Katharine found *H. katharinae* in 1868 in a marshy place on the road to the sea. Sixteen folios together containing about seven hundred of her floral paintings have survived. In 1977 eleven of these folios were reported to be in the library at the headquarters of the Tongaat Group and five at the Natal Museum, Pietermaritzburg. Many of her specimens are held at Kew Gardens and at the herbarium at Trinity College, Dublin.

After James Saunders died in 1892 Katharine stayed on at Tongaat House, except when visiting one or other of her children. She was always a strict disciplinarian, ruling her household with a very firm hand, and in her later years her idiosyncrasies increased. Although flowers and gardening remained her major interest, she spent some time investigating family genealogy. Spiritualism, then a widespread movement in Britain even among intellectuals, was also a subject that attracted her attention.¹⁶ A strong antivivisectionist, she objected to the teaching of physiology classes in colleges. Katharine Saunders died at Tongaat on 23 June 1901 in her seventy-seventh year,¹⁷ leaving a very creditable legacy of contributions to the botanical exploration of Natal in the early years of European settlement.

Another early botanical artist who painted the flora of Natal and the Transvaal was MARIANNE EDWARDINE FANNIN,¹⁸ later JACOB and then ROBERTS (1845–1938). The daughter of Thomas Fannin, she was born in Dublin on 2 March 1845, just before her family emigrated to South Africa. After two years in the Cape, the Fannins moved to Natal, becoming one of the earliest settler families in the midlands region of the colony. Fannin called his farm Dargle, the name by which the whole district was soon known.

Marianne and her brother George Fannin developed strong interests in the local veld flora, particularly orchids and Asclepiadaceae (the milkweed family). Working as a team, George collected and Marianne painted and pressed their collections, which were sent to William Harvey at Trinity College, Dublin.

In 1869 Marianne Fannin married the Rev. Eustace Wilberforce Jacob. Widowed two years later, she spent some time in England studying music and painting. In 1878, three years after her return to South Africa, she went to the Transvaal, where she married the Rev. Alfred Roberts (later Archdeacon Roberts). They lived in Potchefstroom, about seventy miles southwest of Johannesburg, for much of the 1880s and 1890s. Marianne's botanical interests remained strong; as well as paintings of the local flora, her work included scenes of the Transvaal. She died in Heidelberg, Transvaal, on 18 November 1938 at the age of ninety-three.

LADY DOROTHEA SARAH FLORENCE ALEXANDRA PHILLIPS,¹⁹ née ORTLEPP (1863–1940), while not herself a botanical artist, was a patron of arts and science who deserves mention. Her great service to South African botany was the initiation and substantial early financial support of the preparation of the four-volume *Flora of South Africa*, a work that brought worldwide recognition to its author, Rudolf Marloth.²⁰ Published over the course of nearly two decades in much-extended form from that initially envisaged, the work included contributions from many outstanding women flower painters.

Florence (Florrie) Ortlepp, the only daughter of Albert Frederick Ortlepp and his wife, Sarah, née Forestier-Walker, herself the daughter of a civil commissioner in Colesberg, was born in Cape Town on 14 June 1863. Of German (Silesian) ancestry, Albert Ortlepp was a land surveyor and a keen naturalist. Florence and her brother grew up in Colesburg, her father's home, a frontier settlement in the Karoo veld near the border between Cape Province and the Orange Free State.

As a child she acquired a lasting love for South Africa's wide-open spaces with their wonderful variety of plant and animal life. Her introduction at an early age came from her father, whom she accompanied on his natural history walks across the veld, an activity that led to his several notable contributions to South African ornithology. The early 1860s were times of severe economic depression, and the Ortlepps had little money for the education of their children. The situation changed somewhat by the end of the decade with the start of the South African diamond and gold rushes. The Ortlepp family followed the diggings, and although they had no significant finds, Albert Ortlepp made a modest amount of money by selling claims he had bought earlier, claims that later turned out to be part of the great Kimberley Mine. Florence and her brother were sent to an exclusive dame-school in Cape Town and later, when educational opportunities opened nearer home, to a new school in Bloemfontein in the Orange Free State.

In 1885 she married Lionel Phillips (later Sir Lionel), a hardworking Jewish mine manager from London and a member of the Institute of Mechanical Engineers, who was able to give valuable help to companies then moving into the Transvaal gold and diamond fields (figure 1.2). By the late 1880s Phillips had acquired considerable wealth from his work in mining technology and as a negotiator in the diamond business. Now with ample means at her disposal, Florence made the first of several lengthy visits to Europe. During one of her stays in England she bought five portfolios of original paintings of South African flowers by Mrs. M. Crossman (see below). Her vision was to produce, at her own expense, an illustrated book on South African wildflowers, and she commissioned Rudolf Marloth to write it.

Florence Phillips had wide interests in the arts and natural history and was very active in South African arts and crafts organizations. Both she and her husband worked to encourage up-to-date agricultural practice and themselves demonstrated what could be done on land they bought and farmed in the northern Transvaal. A strong advocate of home industries and the use of South African products in household economy, she was elected president of the Ladies Committee of Witwatersrand Agricultural Society at its first meeting in 1908. Lady Florence died at the age of seventy-seven at the now-historic farm Verlegen, Somerset West, Cape Province, on 23 August 1940, having outlived her husband by four years.

Artist M. CROSSMAN²¹ (Mrs., fl. 1900), whose flower paintings first inspired Florence Phillips to undertake the financing of a book on South African wildflowers, was the wife of Francis Crossman, an official in the Cape civil service. Over the course of twenty-five years in the Cape, Francis Crossman

held positions in centers throughout the colony, in the southwestern Cape, in the eastern region, and in Mafeking in the northeast, giving his wife, who accompanied him, the opportunity to paint flowers from all over the country. Consequently the folios she built up presented a notably complete record of the flowers of South Africa. Bought in London by Florence Phillips, probably in the early 1900s, the folios were accepted by Rudolf Marloth for development into a flora of South Africa.²² Eventually produced in a much-expanded form that incorporated the work of many other flower painters, the flora appeared in a four-volume set over a period of almost two decades.²³ Three albums of Mrs. Crossman's flower studies comprising seventy-two paintings and eight pencil sketches are reported to have been given to Kew Gardens in 1922.²⁴

Perhaps the most widely known of the nineteenth-century women botanical collectors in South Africa was MARY ELIZABETH BARBER,²⁵ née BOWKER (1818–1899). Mary Elizabeth was the ninth child and first daughter in the family of sheep farmer and woolen manufacturer Miles Bowker of Gateshead, Northumberland, and his wife, Anna Maria, a daughter of John Mitford of Mitford Castle, Northumberland. She was born on 5 January 1818 in South Newton, Wiltshire, where her father was farming land rented from the Earl of Pembroke. In 1820 the family joined the wave of British settlers then emigrating to Cape Colony, encouraged by a government-sponsored scheme that promised one hundred acres of land to every man over the age of eighteen; Miles Bowker felt that his sons would have better opportunities there than in Britain.

The family's land allotment was in Albany, near Grahamstown in the southeastern Cape (figure 1.2), a region of great natural beauty and diverse ecology; the Bowker house and farm were near areas of dense bush, very much on the frontier. Bowker knew the value of an education and lost little time in setting up a farm school for his own children and those of his workers. Natural history was an important part of the curriculum, and all the Bowker children were given a thorough introduction by their father, the nearby bush providing endless opportunity for the observation of plant and animal life. Mary Bowker's skill as an accurate observer was further developed by her efforts to keep up with her eight older brothers, young men who soon became well known as outstanding marksmen and hunters; one of them, James Henry, was later widely recognized as a good naturalist.

In 1836 the Bowkers had their first experience of the frontier wars against the Xhosa peoples whose land had been occupied by the English-speaking settlers. Fighting between settlers and native Africans continued throughout the early nineteenth century, devastating many of the frontier settler communities. The Bowkers' farm was no exception. Mary nevertheless maintained her interest in natural history, which intensified greatly after she read botanist William Harvey's *Genera of South African Plants*, the first major botanical work published in South Africa. In it Harvey requested his readers to send him plant specimens from their local regions throughout the country so that he could write a comprehensive Cape flora. Mary began a correspondence with him and supplied many new plants and seeds, help he duly acknowledged in his *Flora Capensis*.²⁶ Over the course of their friendship, which lasted for almost three decades, she sent Harvey about one thousand specimens with descriptive notes; much of the Bowker material is still in the herbarium at Trinity College, Dublin. Harvey named a number of species and genera after her and her brother James Henry, although in their early correspondence she had concealed from him the fact that she was female; few women at that time, especially those in colonial societies, felt free to enter publicly into science-related matters.²⁷

In 1842 Mary married Frederick William Barber, a farmer who had been educated in Europe as an analytical chemist. The marriage brought her further close contact with the Cape naturalist community, Barber being a cousin of Grahamstown physician and naturalist William Guybon Atherstone. Curator of the Albany Museum, Atherstone, who had also been educated in Europe, like Mary collected plants for William Harvey, although his special interests were geology and paleontology.

During the lengthy period of guerrilla warfare between settlers and native Africans that continued in the years following their marriage, Frederick Barber was frequently away at the fighting. Left alone with her young children, Mary found relaxation in her botanical studies and also began observing local birds. Somewhat later, encouraged by her brother James Henry, she developed a strong interest in South African moths and butterflies. In 1863 she contacted entomologist Roland Trimen, who had come to South Africa five years previously for his health and joined the civil service as a clerk. In his spare time he assisted Edgar Layard in arranging on a scientific basis the lepidoptera in the South African

Museum.²⁸ Trimen also began to collect information for a book on the region's butterflies, one of his chief sources being Mary Barber's brother James Henry. Trimen's first small book, *Rhopalacera Africae Australis*, brought out in Cape Town in 1862, led James Henry Bowker to immediately suggest that the next volume would benefit from illustrations and that his sister might be persuaded to help with the work involved; for several years already she had been painting the moths and butterflies of the Albany district. A number of her drawings of caterpillars and pupae were used in the illustrations in *South-African Butterflies*, co-authored by Trimen and James Henry Bowker and published in London in 1887.²⁹

Mary Barber also supplied Trimen with valuable information about crop damage by insects. One such problem was the puncturing of peach skins by night-flying moths and the draining of juices until there was nothing left but stone and skin. Trimen, skeptical about the ability of a moth to penetrate such a tough membrane, had discussed the matter with Charles Darwin, who, although he had no definite proof, inclined to the opposite view. Mary Barber's observations, made in her own fruit orchards, supplied the needed evidence. In 1870, seven years after Mary and he had begun collaborating, Trimen spent several weeks at the Barber farm, collecting and observing butterflies in the area with help from the three Barber children.

Having already supplied the Kew botanists with a number of South African plants and seeds, Mary Barber began direct contact with Joseph Hooker in 1865. In part she was concerned about William Harvey, then seriously ill with tuberculosis, but she also wanted to be in touch with another professional botanist, the government having decided to abolish the post of colonial botanist. Their correspondence continued for the next three decades, and it was largely through Hooker's contacts that she succeeded in getting several of her scientific contributions brought out in Britain.

The first of these was her painting of the bizarre perennial herb, small and globular-shaped with a dense covering of bad-smelling purple flowers, *Brachystelma barberiae*, named after her by William Harvey and published by Hooker in *Curtis's Botanical Magazine* in 1866. Sometimes Hooker passed on her communications to Charles Darwin, who is known to have recommended publication of her 1871 report on the fertilization by carpenter bees of the flowering evergreen shrub or small tree *Duvernoia adhatodoides* as well as her 1874 observations on color changes in the larvae and pupae of the butterfly *Papilio nireus* (see bibliography). Her interest in insectivorous plants began in the late 1860s; she sent her report on the subject to Roland Trimen, and it eventually made its way to Joseph Hooker, who read it before the Linnean Society; an abstract appeared in both the *Gardeners' Chronicle* and the *Proceedings of the Linnean Society*. Her paper on the South African genus *Aloe* was communicated by Hooker to the Royal Horticultural Society and published in their journal (see bibliography). On occasion neither Hooker nor Darwin agreed with her conclusions. Both declined to accept her views on the question of snakes being able to mesmerize their prey, but on this subject she stood her ground, and Hooker arranged for her account of observations (made mainly by her brothers) of snakes capturing prey to be published in the popular British journal *Scientific Opinion*. The last of her botanical communications was published posthumously in the *Kew Bulletin* in 1903: a note on *Stapelias*, cactuslike succulents native to Africa with showy flowers, it reflected her special interest in the genus, two new species of which she is credited with discovering.³⁰ Her flower paintings, most of which are now in the Albany Museum, Grahamstown, include illustrations of thirteen species of *Stapelias*.

The discoveries of diamonds in 1867 in the alluvial flats along the Orange and Vaal rivers in Griqualand West,³¹ some three hundred miles north of Grahamstown (figure 1.2), attracted hundreds and then thousands of prospectors, including Frederick Barber. Mary and her sons joined him for a time in 1871, making the first of her several visits to the area, particularly around the deeper Dutoitspan diggings. Her note on the fertilization of a species of *Salvia* she found during her journey along the banks of the Orange River was read before the Linnean Society by Hooker in 1871 (see bibliography). She also became interested in the geology and archaeology of this dry, semidesert country and collected fossils and prehistoric tools. At the deeper levels in old river diggings she found fine stone hammers and scrapers, spearheads and agate arrowheads, all of which she passed along to the South African Museum. She was well aware of their significance, her brother Thomas Holden Bowker having begun to collect stone tools almost a decade earlier. Much of her material is now considered to belong to the Middle Stone Age of South Africa, approximately the era of the Middle Paleolithic in Europe, when the South African scene was very different from what it is today. Fossilized animal remains from the period

indicate a wealth of animal life, now gone, that points to a cooler climate with a grassy environment that was favorable to Stone Age hunters.

After many months of living in tents, the Barbers acquired a small house at the Dutoitspan diggings where Mary entertained resident and visiting notables. Among them were Cecil Rhodes, who had arrived at the diamond fields in 1871, Frederick Courtney Selous, the hunter and explorer, and the Ortlepp family (see section above on Florence Phillips); in Albert Ortlepp Mary Barber found an enthusiastic fellow naturalist who shared her interest in the paleolithic remains found in many of the claims. Living conditions in the mining camps were very primitive, and disease was common, but Mary steadily maintained her natural history observations. She also wrote several articles describing her life and experiences during the early days of the Kimberley diamond diggings, and she recorded scenes, both before and after the diggings, in a series of sketches that are now of considerable historical interest.³²

In 1872, a year after the South African Philosophical Society was established, Mary was invited to join; the invitation most likely resulted from her friendship and collaboration with founding member Roland Trimen. Believing that women should not be barred from belonging to any society they were qualified to join, and in spite of the prevailing prejudices of the time, she accepted the honor and was duly elected a corresponding member. Her paper on colors and habits of animals was published in the society's *Transactions* in 1878; a response to criticism of Darwin's theory of "female selection," it set out the many ways in which the more colorful and impressive outward characteristics of the male of the species, whether bird, mammal, or insect, had the sole purpose of attracting the female and so ensuring that the female's choice controlled the quality of the next generation. A second paper, a survey of the available information on migratory locusts and the various birds that preyed on them, appeared in the society's *Transactions* in 1880 (see bibliography).

By 1879 the Barber claims in the diamond fields had been largely worked out, and Frederick Barber, feeling the need of a change from the hard labor required there, left on a trip to England that lasted for many years. Mary stayed on in Kimberley for another two years and then sold her property. Over the next decade she spent her winters mainly with her brother James Henry Bowker in Durban and her summers with her two sons, Frederick and Henry. The young men, along with their Barber cousins, were then very active in gold prospecting. In 1884 they found an especially rich deposit they named Barber's Reef at what is now the town of Barberton; they were among the first at the Witwatersrand mines in Johannesburg.

By then in her sixties, Mary steadily continued her observing, writing, and painting. In 1882 she was elected a corresponding member of the Vienna Ornithological Society after her bird paintings had been shown by one of her sons to Emil Holub (1847–1902), a Bohemian physician, Africa explorer, and naturalist who had a practice near Kimberley for several years in the late 1870s.³³ While in Grahamstown in 1886, she read a paper to the Eastern Province Literary and Scientific Society that emphasized the need to maintain the population of insectivorous birds in the colony because of the major insect damage being suffered by fruit crops; the subject was considered important enough for the paper to be brought out promptly in pamphlet form for general public distribution.³⁴

In 1889, with sufficient funds accumulated, Mary and her two sons went to England, where Frederick Barber was still living. While there she visited her fellow artist Marianne North, whom she had met during North's trip to South Africa in 1883; she also talked with William Thiselton-Dyer, director of Kew Gardens since the retirement of Sir Joseph Hooker. The Barbers then traveled for a time in Europe, meeting with naturalist friends, before they returned to South Africa in late 1889.

Thereafter Frederick Barber settled in Grahamstown, where he died two years later. Mary divided her time between her brother James Henry in Durban and her married daughter Highlie Bailie in Pietermaritzburg. In 1898, when she was eighty, her son Frederick arranged for the publication of her poems in London; the work included an introductory tribute by Roland Trimen.³⁵ She died a year later, at the home of her daughter in Pietermaritzburg, on 4 September 1899.

Mary Barber's name is commemorated in the genus *Barberetta*, a member of the primarily Southern Hemisphere family of flowering plants sometimes known as the bloodworts. Her plant specimens are housed at herbaria at the Albany Museum, Grahamstown, at Trinity College, Dublin, and at Kew Gardens. The Albany Museum also has her butterfly collection, in addition to her many paintings of flowers, butterflies, and birds, some of which were destroyed by fire in 1941. A number of additional

flower paintings are in the library of Kew Gardens. In 1962 the *Quarterly Bulletin of the South African Museum* published her account of her travels through South Africa.³⁶

Living much of her life in rough frontier settlements and even rougher mining camps, through several devastating wars and many political readjustments, Mary Barber, even though she had no formal education, made a remarkable contribution to South Africa's early natural history studies. Gunn and Codd suggest that she was probably South Africa's most advanced woman of her time.³⁷

Two other early botanical collectors are mentioned briefly here: M. C. Owen and Florence Mary Paterson.

Miss M. C. OWEN³⁸ (1802–1854) was born in Chelsea, London. When her brother the Rev. Francis Owen and his wife went to Natal in 1836 to help with the work of the Church Missionary Society, she went with them. Arriving at Table Bay in 1837, the Owens, traveling overland by oxcart, made their way to Port Natal (now Durban). Some forty plant specimens Miss Owen is reported to have collected around the area are in the herbarium at Trinity College, Dublin, but the sheets have no original collector's labels, and annotations are in William Harvey's writing.³⁹ Rev. Owen's attempts to establish a mission station at Dingaan's Kraal, near Ulundi, about one hundred miles north of Port Natal, were abandoned within a year, following disastrous fighting between settlers (both British and Boer) and Dingaan, the Zulu king. The Owens were fortunate to escape back to Port Natal and then by ship to the Cape. Because of the difficult conditions under which Miss Owen lived when in Natal, it is considered possible that her collections were made somewhat later, during journeys in the Transvaal in the period before she left South Africa in 1841. Miss Owen died in Alexandria, Egypt, in 1854, when she was about fifty-two.

FLORENCE MARY PATERSON,⁴⁰ née HALLACK (1869–1936), the youngest of the nine children of Russell Hallack and his wife, Sarah, née Geard, was born on 15 July 1869 in Port Elizabeth, on South Africa's southern coast. She was one of the earliest women collectors to be born in the colony. Her father, an English businessman and amateur botanist, collected both locally and in Natal, sending many specimens to William Harvey in Dublin; he also established a natural history club. As a child Florence was encouraged to observe local flora and take an interest in all aspects of natural history. After her marriage to T. V. Paterson of Redhouse, a community a short distance inland between Port Elizabeth and Uitenhage (figure 1.2), she made a comprehensive collection of the flora of the district, an area that had received little attention from botanists over the preceding fifty years. Her specimens went mainly to the herbarium at the Albany Museum, Grahamstown. In a 1919 memoir listing the flora of the divisions of Uitenhage and Port Elizabeth, the museum's director, Selmar Schonland, later herbarium curator and first professor of botany at Rhodes University College, Grahamstown, acknowledged the contributions made by several local collectors "but especially by Mrs. T. V. Paterson of Redhouse, who has inherited from her father, the late Mr. Russell Hallack, an ardent love of the flora of her native country, and who has for a number of years indefatigably laboured in the exploration not only of the divisions of Uitenhage and Port Elizabeth, but also in other parts of South Africa which she has visited."⁴¹

Other botanists who expressed their appreciation for Florence Paterson's help were Edith Stephens of South African College, Cape Town, and Harry Bolus of Cape Town. She assisted Stephens in the 1920s, collecting specimens of the region's stonecrop family, the charophytes (see the later section on Edith Stephens); Harry Bolus acknowledged receipt of material from her in volume 3 of his classic work on the orchids of South Africa.⁴² This material is now in the Bolus Herbarium at the University of Cape Town. Florence Paterson died at Redhouse on 5 June 1936, shortly before her sixty-seventh birthday.

THREE EARLY TWENTIETH-CENTURY ACADEMIC BOTANISTS AND A MUSEUM WORKER

Also included in this survey are Bertha Stoneman, Augusta Vera Duthie, and Edith Stephens, most likely the earliest academic women botanists to work in South Africa, and Louisa Bolus, a very productive museum worker.

BERTHA STONEMAN⁴³ (1866–1943), an American by birth, was the daughter of Byron Stoneman and his wife, Mary Jane, née Markham. She was born on 18 August 1866 on a farm in Lakewood, a few miles west of Jamestown in western New York State. The Stonemans were a distinguished family. Bertha's uncle, Major General George Stoneman, served in the war with Mexico in the 1840s and then in the Union Army during the American Civil War; in the 1880s he became governor of California. Her aunt, Kate Stoneman, was the first woman in New York State to qualify as a lawyer.

Bertha had a high school education and then attended Cornell University, where she studied from 1888 to 1889 and again from 1891 to 1896. She also taught in schools for five years. After receiving her Ph.B. degree in 1894, she continued her studies in the Cornell botany department under the supervision of fungus specialist George Atkinson. Her investigations of the development of several species of parasitic fungi known as anthracoses earned her a D.Sc. in 1896. A lengthy paper in the 1898 *Botanical Gazette* reported her results (see bibliography).⁴⁴

A member of the Congregational church and a deeply religious person, she was devoted to education, especially improving education for women and girls; in 1897 she accepted a one-year appointment to teach botany at Huguenot College in Wellington, South Africa (figure 1.3), about forty miles inland from Cape Town.⁴⁵ She was then thirty-one.

Stoneman's one-year appointment expanded to a lifetime's work. Soon after arriving she became absorbed in the study of Cape flora and spent her free time on the mountainsides searching for plants that she used to establish the college's herbarium. Her collections eventually included plants from many regions of the Cape and the mountains of Lesotho. With steady persistence and considerable effort, she gradually succeeded in putting Huguenot College's botany department on a sound footing, while herself becoming very knowledgeable on the flora of South Africa. In 1906, at the request of the Cape Education Department, she brought out her book, *Plants and Their Ways in South Africa*, a popular work used by schools in the Cape for many years.⁴⁶

In 1921 Bertha Stoneman succeeded her fellow countrywoman Anna Bliss as president of Huguenot University College, as it was then designated. She continued to hold the positions of chairperson in both the botany and philosophy departments as well, but within a short time, overburdened by administrative work, she reluctantly gave up teaching botany. She retired in 1933 at the age of sixty-seven. Although she intended to go back to the United States, a short visit was enough to make her realize that her real



Figure 1.3. Southwest coast, Cape Province.

interests by then were in South Africa. For her remaining years she lived in Bain's Kloof,⁴⁷ an upland region of great botanical interest not far from Wellington.⁴⁸

Bertha Stoneman was remembered as an inspiring lecturer, able to pass along her enthusiasm for botany to her many students, some of whom went on to make important contributions to South African botany and botanical education. Indeed her major legacy was her influence on the course of higher education for women in South Africa. It is also noteworthy that her degree course in botany, started soon after she arrived at the college in 1897, was the first such course offered in any South African institution of higher education, starting six years before a comparable one was established at the South African College (now the University of Cape Town). In 1899 two of Stoneman's students took botany for their degree course. Further, it is reported that a lecture by Stoneman attended by the well-known South African botanist Harry Bolus in 1899 was his inspiration to work toward the establishing of a degree course in botany at the South African College.⁴⁹

For many years she was active in several scientific and academic organizations. A life member of the South African Association for the Advancement of Science, she frequently took part in annual congresses and was president of Section C (Botany) in 1923. She was also a founder and first president of the South African Association of University Women. Even after her retirement, Huguenot University College and its students remained her principal interest. She bequeathed Stonemansion, the retirement cottage she had built at Bain's Kloof, to the college; after the institution closed, the cottage was passed on to the University of Cape Town's botany department in Bertha Stoneman's memory, and it is still used for intensive weekend student workshops. In 1937, four years after her retirement, she brought out a slim booklet of poems.⁵⁰

She died in Bain's Kloof on 30 April 1943, in her seventy-seventh year. The Bertha Stoneman Fellowship for Botanical Research, awarded through the South African Association of University Women, commemorates her life and work.

AUGUSTA VERA (AVIE) DUTHIE⁵¹ (1881–1963), one of Bertha Stoneman's students, is considered to be the first South African-trained botanist appointed to a university lectureship in Cape Province. By the time of her birth, Duthies had been farming in the Belvidere region near the south-coast town of Knysna for almost half a century. The founder of the Knysna Duthie family, Thomas Henry Duthie of Stirling, Scotland, came to the Cape as an ensign in the Seventy-second Highlanders Regiment in the late 1820s; following his marriage to Caroline Rex, the daughter of an already well-established Knysna family, he and his wife returned to Scotland, but on his retirement from the army in 1834 they went back to the Cape and took up farming at Belvidere.

Augusta Duthie was born at Belvidere on 18 July 1881, one of the five children of Lieutenant Archibald Hamilton Duthie and his wife, Augusta Vera, née Roberts. Augusta Roberts, the daughter of Charles Roberts of Drygate, Monmouth, and later of Clent, Worcestershire, a well-read and deeply religious woman, had married Archibald Duthie in 1868 when he was in England during his military service. Augusta Duthie grew up in the fine old family farmhouse, a large building with shady verandas, in beautiful countryside rich in plant life overlooking Lake Knysna. She most likely received the first part of her education at home, as did her brothers, William Henry and Alfred George, who in their early teens went on to St. Andrew's College, Grahamstown.⁵² In 1899, at the age of eighteen, Augusta entered Huguenot College, Wellington, where she studied mathematics and physics but quickly came under the influence of Bertha Stoneman. By the time she graduated in 1901 with a B.A. from the University of the Cape of Good Hope (now the University of South Africa), she had acquired a sound, basic training in botany. The following year she was appointed lecturer in plant science at Victoria College (now the University of Stellenbosch). She was then twenty-one.

The town of Stellenbosch, site of Victoria College, lies about twenty-five miles due east of Cape Town in a wide valley, known as the Stellenbosch Flats, almost completely surrounded by hills. The area is one of tremendous variety of habitat and wealth of plant life; apart from the Cape Peninsula it is the oldest settled part of South Africa, and it attracted the attentions of a number of early plant collectors and explorers (figure 1.4). When Augusta Duthie went there in 1902, it was still a rich hunting ground for botanists, a considerable amount of botanical exploration remaining to be done.

The small botany department that was established at Victoria College in 1902 by the college council (undoubtedly strongly influenced by chemist and botanist Rudolf Marloth⁵³) was initially planned

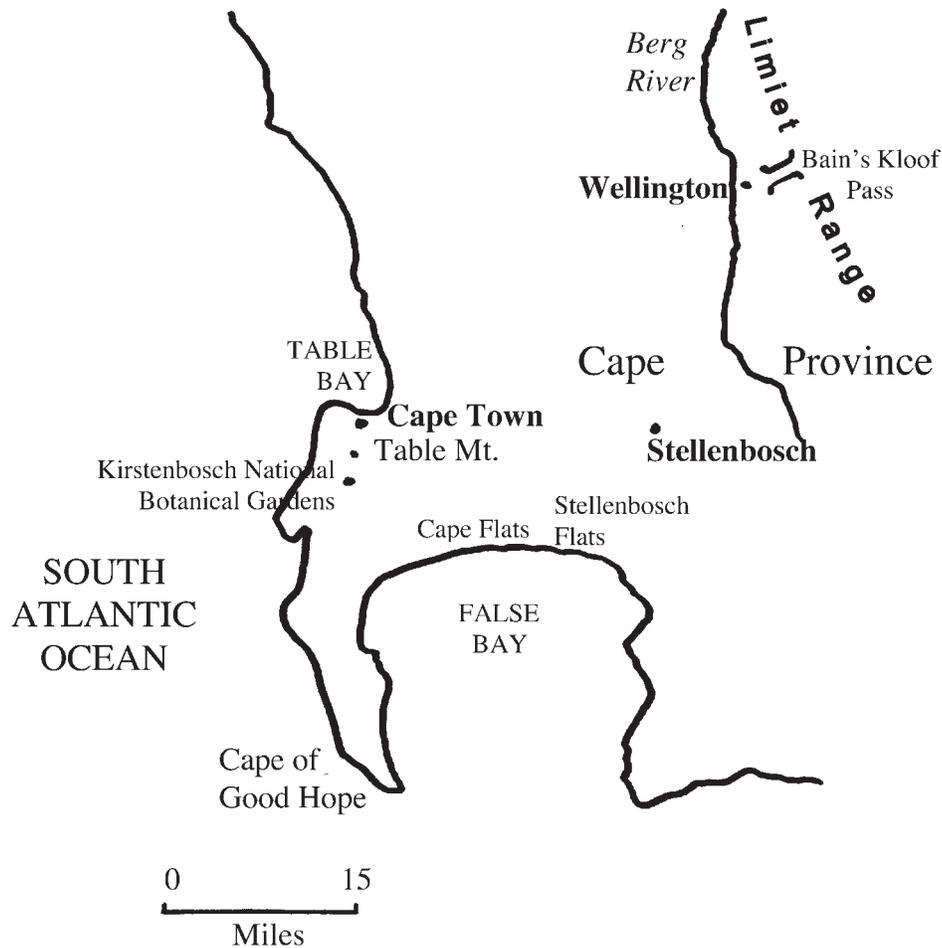


Figure 1.4. Cape of Good Hope region.

to provide classroom instruction only. Facilities and equipment were almost totally lacking; Augusta Duthie had a lecture room but no laboratory, no microscope, no plant collections, and no technical assistance. To supplement a low salary during her first year, she taught a number of courses at neighboring Bloemhof School; as well as botany these included such subjects as English and South African history.

Despite the heavy teaching load, she continued her botanical studies and was awarded an M.A. by South African College in 1910. Two years later she brought out her first journal article, a report of her research in plant anatomy carried out with help and advice from British botanist Henry Harold Pearson, then professor of botany at South African College.⁵⁴ Pearson had collected specimens of the vine *Gnetum africanum* when in Angola as a member of the Royal Society's 1908–1909 Percy Sladen Memorial Expedition in South-West Africa, and some of this material he gave to Augusta for anatomical study. Her results from a detailed examination of stem and leaf (no root material being available) were reported in the British journal *Annals of Botany* in April 1912.⁵⁵

During her first decade at Victoria College, much of her time and effort went into department building. Her first concern was establishing a herbarium. Added incentive for this undertaking came in the form of prizes offered by the Cape Department of Education for the best collections of a few hundred named and mounted plants. Victoria College's botany department won the prize for three years in succession, thereby acquiring some cash for buying books. By 1904 the plant collection had reached five hundred specimens, and the department had ten compound microscopes and a microtome. Four years later the college engaged a part-time assistant shared between the botany and zoology departments, and

in 1912 a second botany lecturer, Sidney Garside, was appointed. Garside, who held an M.Sc. (1911) from Victoria College, Manchester, specialized mainly in plant physiology. He and Augusta developed a warm and lifelong friendship.⁵⁶

Garside's appointment allowed Augusta to have a short period of overseas study leave at Newnham College, Cambridge. She spent the Lent and Easter terms of 1912 there, working in the Botany School under the guidance of Sir Albert Seward, professor of botany at Cambridge, who was well known for his enthusiastic and inspiring teaching. Her paper reporting her study of the process of wound healing in a species of oak appeared in 1913.⁵⁷

As soon as she returned to Victoria College, she went back to the work of department building and expansion. New housing was acquired, including space for an experimental laboratory, a greenhouse was built, the herbarium greatly expanded, and the botanical museum built up to be the largest in the country. In 1920 she increased the holdings further with the addition of a considerable quantity of Australian plants she collected during a year of sick leave.

By 1921 a number of changes had taken place in the botany department. Sidney Garside had returned to Britain, and Gert Cornelius Nel, Ph.D., one of Augusta Duthie's earliest students, was appointed first professor of botany at Victoria College. Then age forty and with administrative work no longer absorbing her time, Augusta taught more-specialized classes, including plant morphology, and took on responsibility for the Stellenbosch district herbarium, which grew to be one of the largest district herbariums in the country. She also became more active in research, bringing out a number of notable reports in the 1920s and 1930s.

Although she collected extensively in the Knysna area, her special interest was the flora of the Stellenbosch Flats, the alluvial valley of about four square miles in extent in which Victoria College was located. Her lengthy discussion of the Stellenbosch Flats flora, published in the *Annals of the University of Stellenbosch* in 1929, was in effect an intensive survey of the entire ecology of the area, a major work that had occupied her for many years. She presented it as a doctoral dissertation to the University of South Africa and was awarded a D.Sc. in 1929. The study covered climate, geology, and soils, as well as plant communities, ranges of species, and even the history of botanical exploration in the area.⁵⁸ Among her other notable studies was her systematic work on the genus *Eriospermum*, a tuberous plant of the Lilaceae family; primarily a South African plant, it occurs in ten distinct species and varieties in the Stellenbosch Flats district.⁵⁹

The lower plants were also a special interest, with three papers on African myxomycetes (slime molds) appearing in 1917 and 1924. Between 1922 and 1924 she published a three-part study on *Selaginella pumila* (one of the club mosses). Her work included investigations of the cones, spores, and gametophytes of this species, one of an ancient line originating in Devonian times that might be thought of as borderline between cryptogamic and seed plants; like the horsetails, the club mosses have a vascular system but no seeds. Studies of South African species of the vascular cryptogams known as the *Isoetes* (primitive ferns) appeared in 1929, and two papers coauthored with Sydney Garside on South African Ricciaceae (bryophytes) were published in 1936 and 1939.⁶⁰

An able and inspiring lecturer and a kindly, cultured person, Augusta Duthie was well liked and held in high regard by her students, some of whom were later to make outstanding contributions to South African botany. Among her many botanical friends both overseas and in South Africa, two who were especially close were her first botany teacher, Bertha Stoneman (see above), and her colleague Louisa Bolus, curator of the Bolus Herbarium in Cape Town. A lifelong friend, Mrs. Bolus often worked with her, providing help in identifications and regularly receiving acknowledgment in her publications.

In 1939, at the age of fifty-eight, Augusta Duthie gave up botany and returned to her family's farm. The death in 1933 of the last of her Belvidere brothers, farmer William Henry, left her as the only person able to manage the farm and estate. She died at Belvidere twenty-four years later, on 8 August 1963, a few weeks after her eighty-second birthday, following some months of serious illness. Burial was at the family cemetery at Belvidere.

Throughout almost four decades of botanical work, Augusta Duthie's major interest was the discovery and study of still-unknown plant life, work in which she made notable progress, especially in the rich Stellenbosch area. Her name is commemorated in several of the plant varieties she found, including four species of Aizoaceae (Vygie family), named for her by Louisa Bolus.⁶¹ Approximately six and a

half acres of Duthie's most important laboratory, the Stellenbosch Flats, were set aside as the Duthie Reserve. The Bolus Herbarium received her bryophyte collection, the rest of her plant and fungal material going to various other South African museums.

HARRIET MARGARET LOUISA BOLUS,⁶² née KENSIT (1877–1970), for many years curator of the Bolus Herbarium, Cape Town, and author of well over two hundred original research papers, has already been referred to in connection with the work of other South African botanists. Louisa, as she was known, was one of the six children of William Kensit and his wife, Jane, née Stuart. Louisa was born on 31 July 1877 in Burghersdorp, Cape Province, about two hundred miles inland from Port Elizabeth on Africa's south coast. The town lies in a mountainous region not far from the border with the Orange Free State. A Londoner by birth, William Kensit had come to South Africa as a child. His wife, who died when Louisa was two years old, was of Scottish background; Kensit was her second husband and Louisa her thirteenth child.

Louisa was educated at the Collegiate Girls' High School in Port Elizabeth, matriculating there in 1898.⁶³ In 1899 she received a first-class teachers' diploma from the Cape Town Teachers' Training College and went on to study at the South African College, which awarded her a B.A. with honors in literature and philosophy in 1902. In her spare time she assisted her uncle Harry Bolus in his herbarium and from him learned the elements of floral structure and plant classification.⁶⁴ In later years she was known for the many hundreds of new species she described in Latin, a language that had been one of her subjects in her degree course.

In 1903 Harry Bolus, who had sponsored much of her education and first awakened her interest in botany, appointed her curator of his herbarium. When he bequeathed this unique herbarium, his outstanding botanical library, and a substantial endowment for upkeep and other expenses to the South African College, it was on condition that his niece remain herbarium curator until her death or until she chose to retire because of poor health or old age; she filled the post for more than half a century.

Her introduction to botanical writing came when she assisted her uncle in compiling his monumental work on the Ericaceae, the heaths, for volume 4 (1905) of Harvey's *Flora Capensis*.⁶⁵ The heaths, a large and strikingly showy family, remained a continuing interest; somewhat later Louisa Bolus herself described and published a number of new species.⁶⁶ Several of Harry Bolus's major publications on orchids benefited considerably from her editorial work. She assisted in the preparation of volume 2 of his *Orchids of South Africa*, which appeared in 1911, the year of his death. It was followed by a third volume, which she prepared from the notes and illustrations he had left. In this work she had help from his son Frank, whom she married in 1912; Frank Bolus contributed additional illustrations for the volume, which came out in 1913. She also coedited Bolus's *Orchids of the Cape Peninsula* (1918).⁶⁷ Her own publications on South African orchids included two papers in the Bolus herbarium's *Annals*.⁶⁸

In 1914 she started the series of articles "Novitates Africanæ" in which she described new species of plants. These appeared in the *Annals of the Bolus Herbarium* (which she edited) until publication of this journal ceased in 1928; the series then continued in the *London Journal of Botany*. Some seventeen articles under the "Novitates Africanæ" title appeared over a twenty-year period until 1934, many of the species described belonging to the large and complex genus *Mesembryanthemum* of the Aizoaceae family.⁶⁹

Louisa Bolus accepted the suggestion put forward in 1925 by N. E. Brown of Kew Gardens that several groups of plants each deserving generic rank were included in the *Mesembryanthemum* genus, but she left to Brown and others the task of separating these out and providing new generic names. Although the field had inevitably changed and developed since her uncle's death, she never departed from the path Harry Bolus had laid out before her. For Louisa this meant that the important work was correct description and illustration of species; theoretical discussions of affinities within a large genus and problems of systematization were of minor interest to her.

Starting in 1927 she began a new *Mesembryanthemum* series in *South African Gardening and Country Life* but shortly after brought together her new species reports in this specialized field in her series "Notes on *Mesembryanthemum* and (some) allied genera," most of which appeared in about twenty-seven publications of the University of Cape Town between 1928 and 1958 and after that in the *Journal of South African Botany* (1959–1969).

Although she focused strongly on the *Mesembryanthemum* genus, she made several noteworthy contributions in other areas, including, for instance, the Iridaceae (iris family). She also provided

descriptions of a considerable number of species and genera of plants collected on the 1908–1909 and 1910–1911 Percy Sladen Memorial Expeditions to South-West Africa.⁷⁰

With her background of training as a teacher, Louisa had a great interest in introducing children to the world of nature. She often took groups of young people to the National Botanical Gardens at Kirstenbosch (figure 1.4) and indeed could be considered founder of the nature study classes, now an important part of Kirstenbosch's work in environmental education.⁷¹ Her short school manual *Elementary Lessons in Systematic Botany* appeared in 1919 and was followed a few years later by the more ambitious work *A Book of South African Flowers*; in 1936 she brought out *A Second Book of South African Flowers*.⁷² Her lasting enthusiasm for environmental education also inspired her many popular articles in *Nature Notes* and the *Journal of the Botanical Society of South Africa*.

A founding member of the Wild Life Protection Society, she had a special interest in birds and published a number of short notes on South African species during the 1920s, mainly in *South African Gardening and Country Life*. In her younger days she greatly enjoyed fieldwork and was one of the first members of the Mountain Club of South Africa. A strong supporter of the Botanical Society of South Africa, which she joined at its founding, she served on its council until 1956. In 1920 she was elected a fellow of the Royal Society of South Africa, and in 1936 the University of Stellenbosch awarded her an honorary D.Sc. Shortly before her death she received the further notable recognition of life membership in the South African Association of Botanists. After she officially gave up the curatorship of the Bolus Herbarium in 1955 at the age of seventy-eight, the University of Cape Town made her an honorary reader in plant taxonomy, allowing her work at the herbarium to continue uninterrupted almost to her death.

A small, quietly spoken, but very determined woman, she had rigid views about how botanical work should be carried out, which perhaps isolated her somewhat from other botanists, especially in her *Me-sembranthemum* studies, the most important part of her life's work. Nevertheless, her contributions to plant taxonomy were impressive beyond a doubt; she is thought to have described more new indigenous species (most likely over 1,700) than any other South African botanist, though not all her determinations have stood the test of later studies.⁷³ She enriched and expanded the Bolus Herbarium, leaving specimen collections well housed and the valuable book collection in good condition.

Louisa Bolus died in Claremont, Cape Town, on 5 April 1970, in her ninety-third year. Her name is commemorated in the Aizoaceae genus *Kensitia*, created by N. E. Brown in 1927.

EDITH LAYARD STEPHENS⁷⁴ (1884–1966), the remaining early South African botanist whose story is outlined here, was born in Cape Town on 6 December 1884, the seventh of nine children in the prominent Cape Town family of Michael Stephens and his wife, Annie. Stephens, chief locomotive superintendent of Cape Railways, emigrated from England to the Cape in the 1860s and there married fellow English emigrant Annie Hoskyn.

Edith matriculated at Rustenburg Girls' High School in the Rondebosch district of Cape Town; a state school founded in 1894, Rustenburg had an excellent academic reputation.⁷⁵ At the South African College, where she enrolled in 1904, she distinguished herself, winning the gold medal in science and being awarded a B.A. (honors botany) in 1906.

One of the first women science graduates of South African College to go on to a long career in academia, Edith Stephens was also one of the first students of botany professor Henry Harold Pearson,⁷⁶ who gave her an early introduction to research. Under his supervision she began an investigation of the embryo sac of the small, rare shrub *Geissoloma marginata*, a native of the southwest region of South Africa. The main object of the research was to throw light on the plant's systematic position—that is, whether it could be regarded as belonging to an anomalous genus of the Penaeaceae family or whether it was the sole representative of a separate order, the Geissolomataceae.

In the autumn of 1907, assisted by the award of an 1881 Exhibition Scholarship and most likely encouraged by Pearson, she went to Newnham College, Cambridge; with the cooperation of botanist Sir Albert Seward she continued her South African work in the Cambridge Botany Laboratory.⁷⁷ A vacation visit to Cape Town from July to September 1908 allowed her to renew contact with Pearson and collect more *G. marginata* from the small patch then known to be growing on Garcia's Pass in the Langeberg Mountains about 160 miles east of Cape Town. Three papers resulted from this research.⁷⁸

Additional plant embryology investigations during her three years (1907–1910) as a graduate research student at Newnham College included a study of the development of the seed-coat of *Carica*

papaya. A species of the tropical, treelike plants of the genus *Carica*, *C. papaya* is grown for its fruit, the pawpaw. Stephens's study used fruit and seeds collected by Pearson in Angola on the 1908–1909 Percy Sladen Memorial Expedition to South-West Africa. Another study, a preliminary examination of reproductive processes in the fern *Pteris droogmantiana*, was carried out jointly with M. G. Sykes.⁷⁹ While at Newnham College she also brought out a survey of recent progress in the study of the embryo sac of angiosperms.⁸⁰ She would undoubtedly have had encouragement in this work from Cambridge botanist Ethel Sargent, who was widely recognized for her research in plant embryology and who had close working ties with Newnham.⁸¹ Stephens thanked Sargent particularly for a suggestion concerning the question of monocotyledon/dicotyledon divergence, an area in which Sargent was especially active.

On her return to Cape Town in 1911, Edith Stephens took up a staff appointment in the botany department at the South African College. Without delay she joined in Pearson's work in the closing stages of the Percy Sladen Memorial Expedition to South-West Africa, work involving the botanical investigation of an extensive region of desert where conditions varied but were more or less severe. Although parts had been explored by earlier workers, a wealth of flora remained for botanists to discover. The region is of very special botanical interest; many of the species are endemic, others markedly limited in distribution, and all are highly adapted in habit, structure, and constitution to desert conditions. In September 1911 Edith led a small party of women assigned by Pearson to collect in the vicinity of the Hot Springs in the Olifants River valley, about one hundred miles to the north of Cape Town (figure 1.3).

In her 1912 paper in the *Transactions of the Royal Society of South Africa*, she described a new species of the flowering shrub *Haematoxylon africanum* [Stephens] found by Pearson at Holoog, Great Namaqualand (figure 1.1); until then only one species of this plant, *H. campecheanum*, L., was known in South Africa.⁸² Most of her reports of her expedition-related work appeared as sections in Pearson's major publication in the *Annals of the South African Museum*.⁸³

After these studies her research interests very soon moved to problems in cryptogamic botany, a branch that, along with embryology, Pearson was particularly interested in establishing at South African College. One of Stephens's first publications in the area reported her investigation of the parasitic root fungus *Striga lutea*, a pest on various native grasses and also on maize, the widely grown food crop. Using material mainly from maize crops in the Transvaal collected by Pearson (who was then studying the organism's life history), she examined the fungus's haustorium, the feeding structure that penetrates cell walls of plant roots absorbing nutrients.⁸⁴

Her area of greatest interest was the aquatic flora of the freshwater vleis, which at that time were scattered over the Cape Flats during the rainy season. Little was known about the cryptogamic flora of these temporary ponds, and since South Africa at that time lacked the facilities for their study, it was necessary to enlist the help of British specialists. Over many years Edith collected with great care and persistence, arranged for other collectors to send her their specimens, sorted the materials and sent them on to the specialists. Her very productive collaboration with algal taxonomist Felix Eugene Fritsch of East London College, University of London, and his colleague (Mary) Florence Rich of Queen Mary College, London, led to a long series of articles with the general title "Contributions to our knowledge of the freshwater algae of Africa." These reports and descriptions of new species often came out under the names of the specialists, Edith being mentioned only in acknowledgments.⁸⁵ However, she was coauthor of at least one paper in the series, a 1921 communication describing materials mainly from the Kentani district in Transkei Territory on the east coast of Cape Colony (figure 1.2); most of the 146 species from 63 genera recorded in this paper, including 6 new species, were collected by the notable amateur botanist Alice Pegler.⁸⁶ Like most of the others in the series concerning materials from southern Africa, the report was published in the Royal Society of South Africa's *Transactions* after being presented at a meeting of the society by Edith.

Other noteworthy collaborative work on freshwater cryptogams included her studies in the 1920s and early 1930s with the distinguished British systematic botanist James Groves (1858–1933), widely considered the world authority on charophytes. Also called stoneworts, the charophytes make up a little-known, complex group of algae that superficially resemble vascular plants more than they do other groups. South Africa's Charophyta, a population rich in endemic types, had been little studied since the work of University of Berlin botanist and comparative morphologist Alexander Braun some six decades

earlier.⁸⁷ Two joint Groves and Stephens papers described new discoveries from southern Rhodesia, Madagascar, and the Transvaal, and in addition extended ranges for other species and reported new stations for previously unknown species.⁸⁸ Stephens also collaborated with a colleague of Groves, Guy Oldfield Allen, known for his work on charophytes from India; Allen collected extensively in India in the 1920s and early 1930s while in the Indian civil service.⁸⁹ A new South African fossil charophyte, *Chara rotunda*, from the Standerton district, Transvaal, was the subject of a joint paper Edith Stephens published in 1948. Reporting an investigation carried out with geologist and thermal waters specialist Leslie Kent of the Geological Survey of the Union of South Africa, it summarized knowledge of fossil South African Charophyta and discussed the possible relationship of the Transvaal find to similar specimens from the eastern seaboard of Cape Province.⁹⁰

Additional research Stephens carried out over the years included studies on South African species of *Hydrodictyon*, or water net, a rather beautiful, green, freshwater alga that takes the form of a netlike hollow sack of pentagonal or hexagonal mesh. An organism with a preference for clean water with a high rate of nutrient turnover, *Hydrodictyon* has now become a pest in some regions. Stephens examined the two South African species *H. africanum* and *H. reticulatum*, recording the latter as new for South Africa, although cosmopolitan and common in the north of the continent.⁹¹

Her investigation of the poisonous alga *Microcystis toxica*, endemic to South Africa, appeared in 1949. The story behind her work is particularly interesting. The alga first came to notice after completion in 1938 of the large dam, Vaaldam, across the Vaal River, about fifty miles south of Johannesburg. This resulted in the formation of a winding, drowned valley, seventy-five miles long and fifteen miles across at its widest, with a capacity of 220,000 million gallons, that submerged fertile farmland along with areas of trees and shrubs. The plentiful supply of nutrients available gave rise to a vigorous “water bloom” of the alga that within four years extended over 98 percent of the length and breadth of the reservoir’s surface and a year later to a depth of at least forty feet. By 1940, livestock drinking dam water were dying; over the next two years stock losses reached the thousands, and other animals, as well as fish and waterbirds, were dying along the length of the Vaaldam reservoir. Controlled animal-feeding experiments begun in Pretoria in 1945 established that the alga was toxic, a finding that provided a clue to mysterious deaths of animals in the past around pans or temporary water ponds in the region. Called “pan sickness,” the phenomenon was widespread in southeastern Transvaal and northeastern Orange Free State. Although poisoning caused by algae is considered unusual, the living *M. toxica* was found to contain an extremely potent and destructive agent that attacks the liver. By 1949 copper sulphate treatment was being successfully used in the Vaaldam reservoir to control the spreading. Asked to examine the alga, Edith Stephens found that colonies consisted of a network of strands and balls of close-packed cells in a mucilaginous sheath. The plant appeared to be a distinct species, although closely allied to *M. aeruginosa* Kutz found in Cape Flats vleis; the latter frequently gave rise to a water bloom but had never been known to cause sickness in cattle.⁹²

Other work Stephens undertook that related to a pressing practical problem was her seaweed investigation. During the Second World War the seaweed-derived agar needed for bacterial culture became very scarce, since it was manufactured mainly in Japan. Edith was therefore asked by the South African Institute for Medical Research to try to find a South African seaweed from which agar could be produced. Collecting from nearby rocky beaches, she was successful; *Gelidium pristoides* provided excellent raw material. Production was quickly put on a commercial basis, and South African output not only filled the needs of domestic bacterial research but supplied Britain as well. Her joint report with F. W. Fox of the Institute for Medical Research presented a brief survey of the distribution of six seaweeds, their general habitat and relative abundance around the coast of South Africa.⁹³

On the occasion of the Cape Town meeting of the British Association for the Advancement of Science in July 1929, Edith Stephens, already acknowledged as South Africa’s foremost algologist, presented a general survey of the freshwater vegetation of the Cape region.⁹⁴

From time to time she brought out reports on plants other than fungi. She was the first to describe the sundew species *Drosera regia* Stephens from the dry, fynbos region in a tributary valley of about three thousand feet elevation at Bain’s Kloof Pass, near Wellington. It is found only in South Africa in that one location. A large plant of striking appearance, it has a flowering stalk topped by a cluster of conspicuous pink blossoms; glistening linear leaves measuring a foot or more surround the stalk. Her paper

in the *Journal of South African Botany* in 1938 reported her studies of three dwarf, terrestrial, South African *Utriculariae*, the genus of aquatic or terrestrial herbs commonly known as bladderworts.⁹⁵

The work of collecting as well as organizing and transporting materials assembled by others involved her in a considerable amount of travel. Her expenses were offset at least in part by grants from the University of Cape Town's Staff Research Fund and from agencies such as the Carnegie Corporation via the South African Research Grant Board.

A matter of very great and continuing concern to her was the preservation of the botanically valuable flora of the Cape Flats (figure 1.4). Threatened by building expansion in the townships around Cape Town and the consequent drainage of the vleis, the area's seasonal algae population seemed destined to disappear. Among the threatened species was the rare and primitive semiaquatic fern *Isoetes capensis* Duthie. Stephens had a special interest in *Isoetes capensis*. Until 1921 no representative of the genus had been reported from the southwestern part of Cape Province, although it was known farther east. In that year she found *Isoetes* in abundance in several shallow, temporary vleis of the Cape Peninsula. She passed along a supply of the fresh material to botanist Augusta Vera Duthie of the University of Stellenbosch (see above) and also made it possible for Duthie, then working on a broad study of South African *Isoetes* species, to study the plant in its natural habitat.⁹⁶ In 1957, using the Cape Tercentenary Foundation Award she received for the work of preservation she was carrying out, Stephens bought a nine-acre wetlands site near the township of Philippi; she had it fenced and gave it to the Kirstenbosch National Botanic Gardens so that at least one Cape Flats wetlands area would be preserved. With friends and helpers she cleared out alien weeds, collected seeds of local plants, and sowed them in and around the vlei to make the site truly representative of the region. Now known as the Edith Stephens Wetlands Park, it plays an important role in Cape region conservation programs.

She was widely known among the general public as an expert on mushrooms. During the agaric season, people continually came to her house in Rondebosch asking if they could safely eat the mushrooms they had collected in neighboring woods; always warm and welcoming, she never turned anyone away. In 1953 she brought out two small books, one on poisonous mushrooms and the other on edible mushrooms.⁹⁷ Both are short, practical field guides on fungus identification, written in clear, plain language for a popular audience. That on edible mushrooms includes interesting recipes for cooking the varieties described, as well as sections on growing mushrooms and drying and preserving fungi. Adding considerably to the practical value of both booklets are several full-color illustrations by Mary Matham Kidd, one of South Africa's outstanding botanical artists.⁹⁸ British mycologist Arthur Anselm Pearson, who wrote the forewords, was known for his work on British mushrooms. He was not unfamiliar with South African mushrooms, either; on a visit to the Cape region in 1948, Pearson had collected mushrooms—many of them new to science—with Edith's assistance.

For most of her twenty-seven years as lecturer at the University of Cape Town, she had charge of the large botany class for first-year medical students, at times a rather obstreperous group. A very popular lecturer, she was remembered vividly by students when many of her colleagues were all but forgotten, in part perhaps because she had some undeniably unusual habits. She was very methodical in her class preparation, but in practical work her stock phrase was "observation and common sense, gentlemen," and she would periodically test students' general powers of observation with a "trick" question in examinations. She spent a lot of time taking care of the botany department's museum; all discarded materials were carefully preserved in case they should later be of use, with the inevitable result that her own office, as well as her home study, had little unused space. On the death of Professor Pearson in 1916, a time when military service and war work were causing staff shortages, she was promoted from lecturer to acting professor and became head of the botany department, serving for several years until two new professors were appointed.

A brief leave beginning in June 1935 allowed her to travel to Britain again and spend some time working at Kew Gardens and the British Museum. She also visited her University of London friend and collaborator Felix Eugene Fritsch and his wife and talked with mycologist Dame Helen Gwynne-Vaughan, professor and head of the botany department at Birkbeck College, University of London. Dame Helen, whose department was much respected for its high standards of instruction and research, was known for her cytological studies on fungal reproduction.⁹⁹

Edith Stephens retired in 1940 but in 1952 became an honorary reader in plant taxonomy at the Bolus Herbarium, a position she held for the rest of her life. Her output of scientific papers was not great, in large part because of the form very often followed in her joint work with specialists. As a result Edith's publications list hardly reflects the importance of her contribution to South African cryptogamic botany, but as her distinguished friend and colleague Margaret Levyns wrote, she "laid the foundations, leaving others to build."¹⁰⁰ A most engaging personality, friendly, cheerful, and energetic, with a tremendous enthusiasm for life and all things living, she was one of the leaders in establishing the presence of women in South African academic botany. The following description gives us a wonderfully vivid snapshot: "I first met Edith Stephens in 1911 shortly after her return from Cambridge. At that time she was distinctly chubby. Everything about her was comfortably rounded. Her rosy cheeks, bright eyes, abundant brown hair and boundless energy struck everyone who knew her at that time. Her looks did not belie her. Good temper and tolerance characterized her then and throughout her life."¹⁰¹

Eager to encourage natural history interests in the general community, she took a leading part in founding the Cape Natural History Club, which had a large and enthusiastic membership almost from its beginning in 1922. From 1934 to 1939 she edited the club's journal, the *Cape Naturalist*, and for many years she was also much involved in the overall running of the organization. She frequently led the group's natural history rambles, always wearing eminently practical skirts on such occasions, even in the days when women's fashions dictated otherwise. She was remembered as a person who traveled on foot, although a colleague recalled that she was also one of the earliest and most enthusiastic motorists in the Cape. Warmhearted as she was, she regularly had her car loaded with charwomen from the university residences, to spare them their trudge home after a long day's work. Despite the increasing infirmities of age, she remained active throughout her whole life; in 1966 she published a five-page report on a new, poisonous agaric from the Cape Peninsula, *Clitocybe toxica* Stephens, a caespitose species she found growing in quantity in one of the region's mixed conifer woods. Her report, which included a warning about the toxicity of the fungus in test animals, was a first record of the species in South Africa.¹⁰² About this time she was also at work on a larger and more comprehensive book on mushrooms, which, sadly, was never completed.

A fellow of the Linnean Society of London since her days at Cambridge and of the Royal Society of South Africa from 1930, she was also a member of the Botanical Society of South Africa. The latter, on whose council she served, had a strong commitment to floral conservation, a matter close to her heart. She had many friends and correspondents in other countries, as well as in South Africa; in addition to her British contacts these included Latvian phycologist Heinrichs Skuja and American cytologist Charles Joseph Chamberlain.¹⁰³

Edith Stephens's home in Rondebosch was a pleasant place, surrounded by a small garden with charming miniature pools fringed with Siberian iris, ferns, and forget-me-nots. She died there at the age of eighty-one on 2 March 1966, of bronchial pneumonia, a few days after catching a chill on a Cape Natural History Club outing.

ASTRONOMY NOTES

Long before the arrival of Europeans in South Africa, the indigenous peoples of the region had developed many ideas and beliefs concerning sky objects and phenomena. Although long passed over and neglected, these ideas, such as Bushman cosmology and the Xhosa system of celestial nomenclature, are now topics of growing interest.¹⁰⁴

By the latter part of the seventeenth century, to a large extent because of the navigational needs of European trading ships, western astronomy was beginning to develop in South Africa. Like plant investigation and botanical exploration, astronomy had this relatively early start at the southern tip of Africa as part of the long effort to reduce the hazards to ships and their crews on the sea route to the Far East.¹⁰⁵ Not surprisingly, although a few women were active in early botanical studies by Europeans in South Africa, only one, Mary Fallows (see below) appears to have taken any part in sky observations before the 1890s.

The foundations of sidereal astronomy in the Southern Hemisphere were laid by the French. Father Tachard and five other Jesuits called at Table Bay on their way to Siam in 1685. The astronomical observations they made in an attempt to determine the true latitude and longitude of the Cape produced inaccurate results, because their instruments were less than adequate for the work; establishing the exact position of the Cape of Good Hope remained a challenge. But a stopping place for ships engaged in the growing sea trade between Europe and the East Indies was essential; the Cape was the chosen place, and ships had to find it before becoming lost in the South Atlantic, as sometimes happened. In 1751, about sixty-six years after Father Tachard, another Frenchman, Abbé Nicolas Louis de Lacaille, arrived at the Cape. A mathematician, well trained at the Paris Observatory, Lacaille built a small observatory and over the course of two years accomplished a prodigious amount of work, including a program of determining the positions of nearly ten thousand southern stars. In addition he determined more accurately than ever before the longitude of the Cape, although his instruments were still less than adequate.

Nineteenth and Early Twentieth Centuries

By the early nineteenth century, Britain having taken control of the Cape (largely to secure her trade route to India), the Board of Longitude in London began an effort to establish a permanent observatory in South Africa. In 1820, with some five thousand British immigrants already settled in the Cape, the Rev. Fearon Fallows (1788–1831) was appointed astronomer for the Cape Royal Observatory.¹⁰⁶ A mathematician educated at Cambridge, Fallows made himself familiar with the use of astronomical instruments and undertook the assignment. By 1828, after seven years and much labor, he had the Cape's first permanent, modern observatory ready for work to begin. In those days, two observers were often necessary to get results with the instruments available, and reliable assistants were not always within call. As a result, Fallows often had to depend on help from his wife, Mary, who in this way became the first woman to make a contribution to astronomical work in South Africa.

MARY ANN FALLOWS,¹⁰⁷ née HERVEY (b. 1796), was the oldest of the eight children (five girls and three boys) in the family of the Rev. Humphrey Archer Hervey, vicar of the parish of Bridekirk, Cumberland, and his wife, Sarah, née Mawson, a daughter of William Mawson, gentleman, also of Bridekirk. Mary Ann was born on 24 March 1796. In January 1821, two months before her twenty-fifth birthday, she married Fallows, who came from the nearby town of Cockermouth, and soon after sailed with him to South Africa.

In his 1913 *History of the Cape Royal Observatory*, Sir David Gill¹⁰⁸ recounted that in a report of 12 May 1830, Fallows stated that Mrs. Fallows had discovered a comet in the constellation Octans, adding, "We have observed it," and that, having lost his assistant due to illness, he had no alternative but to employ Mrs. Fallows at one of the meridian instruments, the only male substitute he had being totally unfit for the office of assistant astronomer.¹⁰⁹ Fallows died of scarlet fever and overwork in July 1831, and Mary Ann returned to Britain two months later. She carried with her copies of Fallows's papers and unpublished observations; the latter were subsequently reduced by Sir George Airy, Britain's Astronomer Royal, and published in the *Memoirs of the Royal Astronomical Society* in 1851.¹¹⁰

No other report of astronomical work by a woman in South Africa is mentioned in readily available sources before the contributions recorded in Gill's 1913 *History*. The first mention of work by a woman at the observatory is Gill's note recording the visit of Irish astronomy historian Agnes Clerke, who spent September and October of 1888 with him and his wife while carefully studying the practical work of the observatory. Agnes Clerke also carried out some practical work; with help from Gill and his night assistant she used the observatory's seven-inch equatorial telescope to observe the spectra of variable southern stars. Her results were published in the journal *Observatory*.¹¹¹

By the late 1880s, when astronomers started work on the massive *Carte du Ciel* project, the Cape observatory was much involved. The project's purpose was the production of a catalog giving accurate positions for all stars in the sky down to magnitude 11.0 and charts showing all stars down to magnitude 14.0. About a dozen observatories worldwide took part, with David Gill playing a leading role in the organizational effort from the beginning. The Cape observatory undertook one of the largest zones, that between southern declinations 40° and 52°, a commitment that required a much-expanded

staff. In assembling this staff, Gill was careful to choose people who by temperament were well suited to carrying out long pieces of routine work that involved skill in observing as well as extremely conscientious measurement and calculation, always checked and counterchecked.¹¹² The employment of women “computers” in the team doing this work marks the entry of significant numbers of women into astronomical research in South Africa.

The Cape work was very thoroughly done. About three thousand photographs and associated observations were completed by the target date of 1900, but the subsequent measurements and reductions took more than twenty years to complete. Gill noted, “The ladies employed on the measurement of the Catalogue astrographic plates have worked steadily and well, although at first it was difficult for them to realize the minute accuracy required. This necessity was gradually instilled, and now the work is on an entirely satisfactory basis.”¹¹³ Beginning with three women in 1895, the number increased to eight by 1900 (figure 1.5). Records for the period up to 1913, six years after Gill’s retirement, include the names of the following women employed as plate measurers, “computers,” and copiers: E. van Lingen (in charge), M. S. Blackwell, M. Coats, N. Crosby, N. Maclear, M. Stevens, M. E. Straith, H. F. Twamley, Agnes G. Crosby, Maud M. Trill, T. Stephens, M. Bowman, S. B. Berg, M. Eedes, C. Halkett, and J. Hutcheon. Several remained on the staff for more than ten years.¹¹⁴

Astronomical associations of amateurs or of both amateurs and professionals, which frequently offered opportunities for participation by women, did not become established in South Africa until the early decades of the twentieth century, despite the Cape’s long history of astronomical work. The government-supported Cape observatory dominated early South African astronomy from the 1820s on, perhaps in part because Cape Town, on a major trade route, was relatively accessible to Northern Hemisphere astronomers. Somewhat in contrast, amateur groups that accepted women members came together in Australia before the end of the nineteenth century, a New South Wales branch of the British Astronomical Association starting in Sydney in 1895 and a Victoria branch in Melbourne in 1897; both welcomed women members (see Australia section). In New Zealand also there was much interest among amateurs; small groups of enthusiasts with private observatories and telescopes independent of club or society were active in both Dunedin and Otago from the 1860s.¹¹⁵

In South Africa the earliest of the region’s amateur groups was formed at meetings held in Cape Town in October and November of 1912. Those present considered the possibility of establishing a branch of the British Astronomical Association, some of them already being members of that organization, but it was decided that it would be better to start as an independent association, in order to develop along lines most suited to South Africa. Of the twenty foundation members of the society then established, the Cape Astronomical Association, three were women: Miss A. Glossop, Miss Ellen Smith, and Miss Hilda Long.

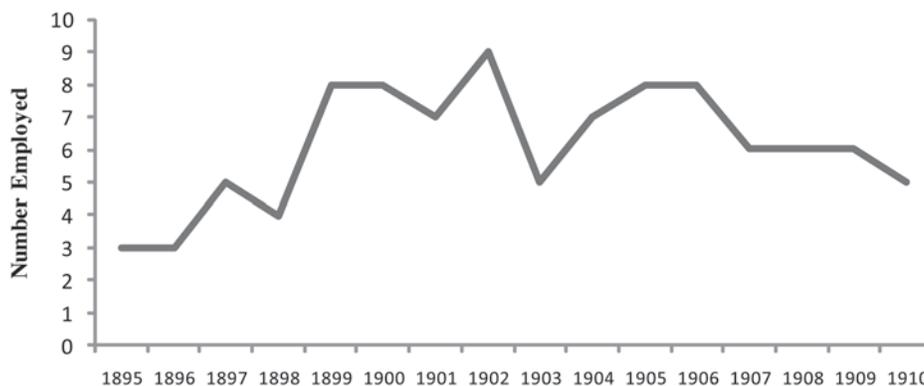


Figure 1.5. Number of women assistants at the Royal Cape Observatory, by year, 1895–1910. Data from Gill, *History and Description of the Royal Observatory, Cape of Good Hope*.

Hilda Long might have been a relative of A. W. Long, also a foundation member and for many years prominent in South African amateur astronomy. A. W. Long had previously been a member of a small group made up of workingmen, ranging from farmers to boot-sellers, in the community of Beaufort West in the southern Karoo (figure 1.3); these men met for discussions on various topics of interest, including Halley's Comet (1910). Sometimes referred to as the Beaufort West Philosophical Club, the group ceased to exist after 1914, with the war and other causes leading to the scattering of the members, but it has been suggested that the origins of the Cape Astronomical Association may not be entirely unrelated to the activities of the earlier Beaufort West club.¹¹⁶ The more immediate stimulus that triggered the founding of the Cape Town society was the widespread interest that had been awakened in the community by the appearance of Halley's Comet. From its beginnings the society benefited from its association with the professionals of the Cape Royal Observatory. S. S. Hough, the observatory's director, was the first honorary president; there was also a certain amount of cooperation between the observatory and the amateurs in the form of permission to use instruments, with both A. W. Long and his fellow Cape Town amateur, the Australian J. F. Skjellerup, being given access to a 15.2-centimeter refractor and later to a 17.8-centimeter refractor at the observatory for variable star observing.

Important as the process of establishing South Africa's first amateur group was, it was nevertheless the case that none of the women foundation members appeared to have been prominent in the group's early activities, even as nonobservers making contributions such as serving on the committee or acting as librarian. In Johannesburg, on the other hand, where an amateur astronomical association was formed in 1918, Mrs. J. Moir was an active member from the beginning, serving on the committee for three years and as secretary from 1919. She was the wife of another very active member, Dr. J. Moir of Johannesburg. Mrs. Moir's death in 1921 was felt to be a considerable loss to the group. A second woman member, Mrs. Wood (possibly a relative of fellow association member H. E. Wood), is also mentioned in the early Johannesburg records.

Work by amateurs increased markedly in the 1920s, by which time the Cape and Johannesburg associations had merged to form the Astronomical Society of South Africa. In the Johannesburg section, Miss M. L. Troughton made notable contributions; secretary of the section in 1926–1927 and chairman in 1927–1928, she was especially active in a very productive Mars team directed by Dr. Moir, which observed the 1924 close opposition of Mars with special care. A member of the Cape section when she lived in Natal, Troughton had transferred to the Johannesburg section when she moved to that city. Various other autonomous centers, such as those at Durban, Bloemfontein, Pietermaritzburg, and Pretoria, later joined the Astronomical Society, but participation in these by women members has not been followed.¹¹⁷

It may be said in summary that readily available information provides little indication that women carried out significant work in astronomy in South Africa before the 1890s, except for the contribution of Mary Fallows in 1830. Not until Sir David Gill's tenure in the post of Her Majesty's astronomer at the Cape of Good Hope (1879–1907) were women engaged in astronomical activities in the region. The establishment of amateur groups by the second decade of the twentieth century gave a number of women opportunities to follow their interests in the field, Mrs. J. Moir and Miss M. L. Troughton, both of Johannesburg, perhaps being the most prominent of the early women participants.

NOTES ON SOUTH AFRICAN COLLEGE

South African College, where three of the later women botanists mentioned above had part of their education, was founded in Cape Town in 1829 as a first step by the government to fill the growing colony's need for trained manpower.¹¹⁸

Throughout much of the nineteenth century, education in South Africa was provided mainly by church and mission schools, along with a number of private institutions. Because of their severe lack of funds, colonial governments had done little to combat the widespread illiteracy among the population. The problem was especially severe among the twenty-six thousand Afrikaners in the region who lived in isolated farming communities and who, after Britain took control of the colony in 1806, were permanently cut off from the Netherlands.

On its opening in 1829, the South African College and Zuid-Afrikaansch Athenaeum had three “chairs” and an emphasis in its syllabus on science and literature. At that time the colony’s European population was just over fifty-five thousand. Cape Town was the only community of any size, its total population being about eighteen thousand, half of which was European, mainly Dutch, and the others African slaves. There were no docking facilities at Table Bay, except a wharf built by the Dutch, and roads to the interior were primitive. Nevertheless, a number of prominent Cape families had acquired extensive estates and considerable wealth. Several important institutions had been opened, including a hospital, a library, and an observatory. The nondenominational and mixed Dutch-British committee set up in 1828 to establish a college produced concrete proposals, which it sent to the colonial governor, who in turn submitted them to London. Financial help was also sought from other bodies, and a public subscription fund started. The college that opened the following year was a very modestly equipped school, but initial demand for instruction was greater than anticipated; the original staff of three had to be expanded, and a considerable amount of the teaching was unpaid. Entrance standards were necessarily very low, with many entrants being little more than schoolboys. Throughout much of the nineteenth century, scarce funding periodically caused great difficulty. Until the 1890s the student population was often below one hundred; but by the turn of the century the institution had developed into a reasonably equipped college, and student numbers were increasing rapidly. By the 1890s a number of academically sound, state-supported secondary schools were being established, schools for girls as well as schools for boys, and these were providing well-prepared college entrants. With its roots deep in the soil of South Africa and its nondenominational and mixed Dutch-British emphasis from the beginning, the college became a model for later institutions of higher education.

The first attempt to open the educational benefits of South African College to women came in 1881, when an extra-collegiate botany class for ladies was arranged at Cape Town Botanic Gardens. Five years later the chemistry department admitted women to its classes as a one-year experiment, the success of which led to the opening of all classes to women in 1887; ten women enrolled that year. Housing for women students was provided only after the turn of the century.

Within a few years of their being admitted, several women students were winning notable honors. The first was literature student Isabella Stephens, who received the Governor’s Prize for all-round excellence in 1888 and the college’s gold medal in literature in 1890. In 1898 Nellie Muir, a student at the college from 1895 to 1898, was awarded a B.A. with honors in mathematics and natural science. Although Muir herself never went on to scientific work, both her father and her son had distinguished careers; her own outstanding undergraduate record perhaps warrants the inclusion here of information about her found in their biographies.

NELLIE BROWN MUIR,¹¹⁹ later SPILHAUS (b. 1877?), was the eldest daughter in the family of four children of the distinguished Scottish mathematician and educator Thomas Muir (1844–1934), later Sir Thomas Muir, and his wife, Margaret, née Bell. The Muirs went to Cape Town in 1892, Thomas Muir having been appointed to the post of superintendent general of education in the Cape Colony. Nellie Muir was then about fifteen. An outstanding student, she won two top awards at South African College: the Governor’s Prize in 1895 and the college’s gold medal in science (shared with E. Hilner) in 1897. In 1903 she married Karl Antonio Spilhaus, owner of his own shipping agency. She most likely spent some years out of South Africa, her husband being European trade commissioner for South Africa for a time. Long active in community affairs, she later became the first woman member of the Provincial Council in Cape Province.¹²⁰

A number of other women students distinguished themselves in the sciences in the first decade of the twentieth century. Lucy Stapleton, a student from 1901 to 1903, received an honors degree in physics, and Ellen R. Behrman, recipient of the Governor’s Prize in 1906, was awarded the gold medal in science and a B.A. with honors in mathematics in 1908, followed by an M.A. in mathematical science in 1909. In 1913 the college appointed Behrman to a lectureship in mathematics, but she resigned a year later.

Edith Layard Stephens (see above), probably the first of a number of notable women botanists to have a long association with South African College, received her B.A. with honors in botany in 1906 and the college’s gold medal in science. Louisa Kensit (later Bolus), whose botanical career is also sketched above, was awarded a B.A. with honors in literature and philosophy in 1902 but went on to important

work in plant taxonomy. The third outstanding South African woman botanist discussed above, Augusta Duthie, received part of her postgraduate training at South African College, which awarded her a D.Sc. in 1929. Both Stephens and Duthie benefited from the very substantial upgrading and development of the college's botany department following the appointment of Harold Henry Pearson in 1903. Pearson initiated and encouraged new lines of research, while also expanding instruction (to a large extent to meet the increasing needs of medical students for training in the biological sciences).

SUMMARY

In a number of ways the story of the early women contributors to the development of the sciences in South Africa forms a pattern that reappears in the stories for Australia, New Zealand, and Canada. Work in botany, especially collecting and illustrating, figures prominently in accounts of all four colonial groups. In the three Southern Hemisphere countries, this came about in large part as a response to the tremendous wealth, variety, and beauty of the exotic plant life to be discovered and described for European audiences; the work could bring not only the excitement of first discovery, but also great satisfaction. In South Africa, the oldest colony, work by women started before the beginning of the nineteenth century, some fifty years earlier than in Australia and about three decades before European women naturalists were active in Canada. The first contributions came from well-to-do temporary visitors such as Lady Anne Monson and Arabella Roupell, but by the mid-nineteenth century, most of the outstanding women plant collectors and flower painters were lifetime settlers, Katharine Saunders and Marianne Fannin of Natal being especially prominent. By the early 1900s, educational opportunities at high school and college level for girls as well as for boys had been established in several centers throughout Cape Colony, and from then on South African women began to take part in gradually increasing numbers in botanical research and teaching at the university level; three of the earliest were Augusta Duthie, Louisa Bolus, and Edith Stephens. The long tradition of outstanding botanical illustration by South African women continued well into the twentieth century; few were active in the sciences other than botany until about the second decade of the twentieth century.

In this selection of early South African women with scientific interests, three might well be singled out as especially remarkable: the indefatigable naturalist Mary Barber of the Kimberley diamond mine camps; the colorful and energetic collector and artist Katharine Saunders, one of the bold and enterprising pioneer settlers in Natal; and that especially likable and attractive personality Edith Stephens, collaborator *par excellence* in botanical work, who had a wonderful sympathy for all living things. These three students of nature in a land of unrivaled floral beauty and exceptional variety and abundance of plant form entered into the exploration of the riches they found before them with tremendous zest and lifelong enthusiasm.

NOTES

1. For a detailed account of early botanical work in South Africa see Mary Gunn and L. E. Codd, *Botanical Exploration of Southern Africa . . . from the Days of the East India Company until Modern Times* (Cape Town: A. A. Balkema, 1981; published by the Botanical Research Institute).

2. The unique assemblage of plants, known as the Cape Flora, is the smallest of the six floristic kingdoms of the planet. There are about eighty-five hundred species in the Cape floral region, and nearly three-quarters, including six entire plant families, are found nowhere else. These include the unique fynbos plants, adapted to poor soils and periodic fires, the Cape heaths of the Ericaceae family, and the succulents known as the "mesembs" (see the later text; figure 1.4 gives a more detailed map of the region). About twenty-five hundred plant species are found on the Cape Peninsula alone. See Susan Mahr, "Kirstenbosch Botanical Gardens," Horticultural Information Page, Archived Feature Article, www.hort.wisc.edu/mastergardener (Feb. 2009).

3. Gunn and Codd, *Botanical Exploration*, 70–71; Janet Browne, "Monson [*née* Vane] Lady Anne (c. 1727–1776)," in *Oxford Dictionary of National Biography* (Oxford: Oxford University Press, 2004), hereafter *ODNB*, online ed., www.oxforddnb.com/view/article/57839 (March 2006); T. H. Bowyer, "Monson, George (1730–1776)," in *ODNB*, online ed., www.oxforddnb.com/view/article/18985 (March 2006).

4. Gunn and Codd, *Botanical Exploration*, 89; J. M. R. Cameron, "Barrow, Sir John, first baronet (1764–1848)," in *ODNB*, online ed., www.oxforddnb.com/view/article/1544 (March 2006).
5. In 1795 Britain annexed Cape Colony, taking over from the Dutch; the latter resumed control in 1803, but in 1806 British authority was reestablished, mainly to secure Britain's sea route to India from attack by France.
6. R. A. Dyer, "Botanical research in South Africa in the twentieth century," in *A History of Scientific Endeavour in South Africa*, ed. A. C. Brown (Wynberg, Cape: Royal Society of South Africa, 1977), 240–64, on 258.
7. Gunn and Codd, *Botanical Exploration*, 301; F. G. Richings, "RouPELL [*née* Pigott], Arabella Elizabeth (1817–1914)," in *ODNB*, online ed., www.oxforddnb.com/view/article/57851 (March 2006), and "Mrs. Arabella RouPELL and her 'Cape Flowers.'" *Quarterly Bulletin of the South African Library* 27 (1972): 4–13; Allan Bird, "Cape Flowers by a Lady," *Africana Notes and News* 10 (1952): 142–45; *Arabella RouPELL: Pioneer Artist of Cape Flowers*, text by Allan Bird (Johannesburg: South African Natural History Publication Co., 1975, limited ed. of 625 copies).
8. Arabella RouPELL in her preface to *Specimens of the Flora of South Africa by a Lady*, quoted in Bird, *Arabella RouPELL: Pioneer Artist* (pages unnumbered).
9. Botanist William Henry Harvey went to South Africa in 1835, accompanying his brother, who was colonial treasurer at the Cape. His botanical explorations of the region were somewhat curtailed by official duties when, following his brother's death, he accepted the treasurer position. During his seven years in the colony he made a considerable contribution to knowledge of the region's flora. His *Genera of South African Plants, arranged according to the Natural System* (Cape Town: A. S. Robertson) appeared in 1838. A second work, *Flora Capensis: Being a Systematic Description of the Plants of the Cape Colony, Caffraria, and Port Natal*, a jointly authored work with Otto Wilhelm Sonder, was published in three volumes over a six-year period (Dublin: Hodges, Smith and Co., 1859–1865). Four more volumes, including additions and revisions, were brought out by various botanists under the editorship of Arthur Hill and William Thiselton-Dyer, Joseph Hooker's successor at Kew Gardens; publication of these continued intermittently in the years up to 1933, some editions being brought out in London (L. Reeve) and in Cape Town, as well as in Dublin.
10. [Arabella RouPELL], *Specimens of the Flora of South Africa: Cape Flowers by a Lady* (London: Shakespeare Press of Pall Mall, 1849).
11. [William Hooker], "Specimens of the flora of South Africa. By a lady. Atlas folio. London. 1850," *Hooker's Journal of Botany and Kew Garden Miscellany* 2:127.
12. Gunn and Codd, *Botanical Exploration*, 309; Adolph W. Bayer, "Aspects of Natal's botanical history," *South African Journal of Science* 67 (1971): 405; Katharine Saunders and A. Bayer, *Flower Paintings of Katharine Saunders: Botanical and Biographical Notes and Explanations* (Tongaat: Tongaat Group, 1979).
13. For further information on Mark McKen see Donal P. McCracken, *A New History of the Durban Botanic Garden* (Durban: Durban Parks Department, 1996), and Bayer, "Aspects of Natal's botanical history," 403, 405.
14. See note 9.
15. What began as James Saunders's sugar producing estate at Tongaat one and a half centuries ago is now part of a large, diverse business conglomerate, the Tongaat-Hulett Group, with interests throughout southern Africa. Just as it did in Saunders's time, it holds a leadership position in technological innovation and readiness to adapt to changing conditions. Current interests include development of fuel ethanol production from sugarcane and other biofuel sources; see www.tonga.co.za (April 2009).
16. Janet Oppenheim, *The Other World: Spiritualism and Psychological Research in England, 1850–1914* (Cambridge, UK: Cambridge University Press, 1985); see also the section on Eleanor Sidgwick in Mary R. S. Creese, *Ladies in the Laboratory? American and British Women in Science, 1800–1900* (Lanham, Md: Scarecrow Press, 1998), 220.
17. Sources differ on Katharine Saunders's place of death. Gunn and Codd (*Botanical Exploration*, 309) stated that the place was Tongaat. Edward Saunders, great-grandson of Katharine, indicated that she died in Durban at the home of her daughter Laura; see biographical section in Saunders and Bayer, *Flower Paintings of Katharine Saunders*, 35–115.
18. Gunn and Codd, *Botanical Exploration*, 152–53; Bayer, "Natal's botanical history," 404–5.
19. Gunn and Codd, *Botanical Exploration*, 279; Thelma Gutsche, *No Ordinary Woman: The Life and Times of Florence Phillips* (Cape Town: Howard Timmins, 1966).
20. Botanist, analytical chemist, and pharmacist Hermann Wilhelm Rudolf Marloth (1855–1931), a native of Prussia, was one of South Africa's leading botanical explorers of the late nineteenth and early twentieth centuries. Generally known as Rudolf Marloth, he received his formal scientific training at the University of Berlin; a thesis on the mechanical protection of seeds brought him a doctoral degree at Rostock in 1883. Immediately after that he emigrated to South Africa, where he spent a few years working as a chemist and then pharmacist, first in Cape Town and subsequently in Kimberley, before accepting a position teaching chemistry and physics at Victoria College, Stellenbosch (now the University of Stellenbosch). Later he taught natural sciences, including botany,

at the Stellenbosch agricultural school (now Elsenburg Agricultural College). From his arrival in South Africa he began assembling a herbarium, undertaking extensive plant studies throughout the region, exploring parts of the country little known or unknown botanically. Perhaps the first person with a thorough botanical training to settle permanently in South Africa and study the region's flora, he discovered and described numerous new species and several new genera. His herbarium ultimately housed twenty thousand specimen sheets, now incorporated into the National Herbarium, Pretoria, where it added considerably to the representation of Cape flora. Marloth is also credited with having been the first to start the science of plant chemistry in South Africa. Author of a great many papers and books, he is most widely known for his *Flora of South Africa*, his greatest work (Rudolf Marloth, *The Flora of South Africa: with synoptical tables of the genera of the higher plants*, 4 vols. [Cape Town: Darter Bros., and London: W. Wesley & Son, 1913–1932]). See P. G. Jordaan, "Marloth, Hermann Wilhelm Rudolf," in *Dictionary of South African Biography*, vol. 1 (1968), 518–21; Dyer, "Botanical research," 240–64, especially 245; Frank L. Warren, "Organic and biological chemistry in Southern Africa," in *History of Scientific Endeavour in South Africa*, 283–317, especially 284.

21. Gunn and Codd, *Botanical Exploration*, 125.

22. See note 20.

23. Notable among the other artist contributors to the flora was self-taught Ethel May Dixie (1876–1973), who earned her living from an early age by selling her paintings of flowers. Commissioned by Marloth to prepare work for his book, she was associated with him for several years. Early in her career she prepared three master albums of flower studies from which she made copies as needed. A collection chosen from these studies was published as the folio *Wild Flowers of the Cape of Good Hope* (Cape Town: Janda Press, 1953); descriptions were provided by R. H. Compton, director of the National Botanic Gardens, Kirstenbosch, Cape Town; John Paris, director of the South African National Art Gallery, wrote the foreword. Dixie's work is well represented in the Museum Africa, Johannesburg (Gunn and Codd, *Botanical Exploration*, 135; anonymous note in Dixie, *Wild Flowers of the Cape*).

24. Gunn and Codd, *Botanical Exploration*, 125.

25. Alan Cohen, "Mary Elizabeth Barber: South Africa's first lady natural historian," *Archives of Natural History* 27, no. 2 (2000): 187–208, and "Barber [*née* Bowker], Mary Elizabeth (1818–1899)," in *ODNB*, online ed., www.oxforddnb.com/view/article/57848 (March 2006); Gunn and Codd, *Botanical Exploration*, 87; T. Gutsch, "Barber, Mary Elizabeth," in *Dictionary of South African Biography*, vol. 2 (1972), 26–27.

26. See note 9.

27. See also the case of botanical artist Arabella Roupell (above), who chose to bring out her folio, *Specimens of the Flora of South Africa* (1850), without her name on the title page.

28. Ornithologist Edgar Leopold Layard (1824–1900), a younger brother of archaeologist and politician Sir Austen Henry Layard, was the first curator of the South African Museum, Cape Town. His *Birds of South Africa* (1867), in which he made many acknowledgments to Mary Barber for her specimens and observations, was the first definitive account of South African birds. Yet another noteworthy nineteenth- and early twentieth-century member of the Layard family was Nina Layard (1853–1935), whose father was a cousin of Edgar Layard. Nina Layard's archaeological work on sites in East Anglia resulted in numerous reports from the late 1890s until the mid 1920s. See Steven J. Plunkett, "Layard, Nina Frances (1853–1935)," in *ODNB*, online ed., www.oxforddnb.com/view/article/58931 (Oct. 2006) and Creese, *Ladies in the Laboratory?* 341, 345, 426.

29. Roland Trimen and James Henry Bowker, *South-African Butterflies: A Monograph of the Extra-tropical Species* (London: Trübner, Ballentyne, Hanson and Co., 1887–1889), 3 vols., illust.

30. M. E. Barber, "Stapelias," *Kew Bulletin* (1903): 17–19.

31. Griqua were people of racially mixed descent and culture who adopted Afrikaans as their language. Driven out of Cape Colony in the late eighteenth century, they settled in the Orange River basin. In the early 1860s some sold their land rights to the Boers and trekked east across the Drakensberg Mountains to what is now known as Griqualand East. Following the first diamond discoveries in 1867 near Kimberley (on the eastern border of what became Griqualand West), both Boers and British became interested in establishing sovereignty over the region. In 1873 Griqualand West was officially declared a British colony, with its capital at Kimberley, and in 1880 it was annexed to Cape Colony. With the formation of the Union of South Africa in 1910 it became part of northeastern Cape Province.

32. Mary E. Barber, "Night at Du Toit's pan; notes from a journal," *Cape Monthly Magazine* 3 (1871): 331–33; "In the claims," *Cape Monthly Magazine* 4 (1873): 39–45; "The dark races of the diamond-fields," *Cape Monthly Magazine* 7 (1873): 378–81; "The Commetje Veldt at Kaffraria," *Cape Monthly Magazine* 9 (1874): 125–27. Mary Barber's paintings of scenes at the diamond fields are in the Albany Museum, Grahamstown.

33. Emil Holub was a friend of August von Pelzeln (1825–1891), an Austrian naturalist specializing in ornithology and a widely recognized expert on the birds of Brazil. Pelzeln was custodian of the bird and mammal collections at the Imperial Museum, Vienna, for many years and also served as coeditor of the *Vienna Ornitho-*

logical Society's journal *Die Schwalbe*. For Holub see www.1911encyclopedia.org/Emil_Holub (March 2009). Information about von Pelzeln came from www.darwinproject.ac.uk/darwinletters/namedefs/namedef-3735.html (April 2009).

34. Mary E. Barber, *A Plea for Insectivorous Birds* (Grahamstown: Richards, Slater & Co., 1886).
35. Mary E. Barber, *The Erythrina Tree and Other Verses* (London: Rowland Ward, 1898).
36. Mary E. Barber, "Wanderings in South Africa; an account of a journey from Kimberley to Cape Town and on to Natal," *Quarterly Bulletin of the South African Museum* 17 (1962): 39–53, 61–74, 103–16; 18 (1962): 3–17, 55–68.
37. Gunn and Codd, *Botanical Exploration*, 87.
38. Gunn and Codd, *Botanical Exploration*, 268; Bayer, "Natal's botanical history," 402.
39. See note 9.
40. Gunn and Codd, *Botanical Exploration*, 272–73.
41. Selmar Schonland, "Phanerogamic flora of the divisions of Uitenhage and Port Elizabeth," *Botanical Survey of South Africa*, Memoir No. 1 (1919), Introduction, 7 (Pretoria: Government Printing and Stationery Office, 1919).
42. Harry Bolus, *Icones Orchidearum Austro-Africanarum Extra-Tropicarum*, vol. 3, ed. H. M. L. Bolus (London: William Wesley & Son, 1913). H. M. L. (Louisa) Bolus brought out this last volume of Harry Bolus's classic work two years after his death. See below for a sketch of Louisa Bolus.
43. Gunn and Codd, *Botanical Exploration*, 336; A. F. M. G. Jacob Guillamod, "Stoneman, Bertha," in *Dictionary of South African Biography*, vol. 2 (1972), 717–18; A. M. Bottomly, "In memoriam. Bertha Stoneman, D.Sc., Ph.D. [sic]," *South African Journal of Science* 40 (1943): xxiv–xxv; information from Michael Luther, Division of Rare and Manuscript Collections, Cornell University Library.
44. This paper was also included in a series of botanical tracts published in book form—Bertha Stoneman, *A Comparative Study of the Development of Some Anthracnoses* (Chicago: University of Chicago Press, 1898). A second publication, on Basidiomycetes, published jointly with her adviser, appeared the same year; George Francis Atkinson and Bertha Stoneman, *A Provisional Key to the Genera of Hymenomyces (mushrooms, toadstools, etc.)* (Ithaca, N.Y.: n.p., 1898).
45. Founded as Huguenot Seminary in 1874, this institution was the first in South Africa to offer higher education for women. To a large extent it was modeled on Mount Holyoke College for women in Massachusetts; its first leaders were two Mount Holyoke graduates, Abbie Park Ferguson and Anna Elvira Bliss. Ferguson and Bliss went to South Africa in response to an appeal to Mount Holyoke from Dr. Andrew Murray, a Dutch Reformed Church minister in Wellington, requesting teachers in order to start a seminary along the lines of Mount Holyoke. The institution's marked religious character reflected the directive that it should not only give girls sound intellectual training but also foster the development of truly moral and religious women and produce a supply of suitable teachers that the Cape badly needed. American women directed the seminary, later Huguenot University College, for its first fifty years, and many of its early teachers were American. A collegiate department was established in 1884; B.A. degrees were first awarded in 1898. Huguenot University College closed in 1950, but the buildings were taken over by the Dutch Reformed Church. Opened again as Huguenot College, the institution now trains social workers; see novelist and editor Anna J. D. de Villiers (Head of Huguenot University College, 1940–1950), "Huguenot College," in *Notable American Women, 1607–1950: A Biographical Dictionary*, 3 vols., ed. Edward T. James (Cambridge, Mass.: Belknap Press of Harvard University Press, 1980), vol. 1, 607–10; "Huguenot College. Overview," www.huguenote.co.za/eng/oorsig_wie_is_ons.html (April 2009).
46. Bertha Stoneman, *Plants and Their Ways in South Africa* (London, New York: Longman's, Green, 1906); a second, expanded, edition appeared in 1915.
47. The wild mountain valley (*kloof*) known as Bain's Kloof Pass, now a national monument, takes its name from Andrew Geddes Bain (1797–1864), the Scottish road builder, geologist, and paleontologist who emigrated to the Cape in 1816. In 1853 Bain completed what has been described as "the herculean task" of building a road up the wild kloof of the Wit River and through the Limiet Mountains (figure 1.3), forging the final link in a system connecting the Cape settlements and the interior. With the opening of the pass, Wellington became the gateway to the Cape interior. Andrew Bain is also widely recognized as one of South Africa's pioneers in the paleontology of the Karoo system; his initial discovery in 1838 of a specimen of a distinctive line of fossil reptiles was quickly accepted by the London geological community as being especially important. See William J. Talbot, "Pathfinders and pioneers, explorers and scientists 1487–1976," in *History of Scientific Endeavour in South Africa*, 1–32, on 18, and also A. C. Brown, "The amateur scientist," in *History of Scientific Endeavour in South Africa*, 454–73, on 471–73.
48. The Bain's Kloof mountain region is especially noted for being rich in fynbos, distinct communities of plants characterized by great variety of species in a small area, often a place with poor or infertile soil. Fynbos plants are typically fire adapted, tough shrubs and plants with small, hard leaves, some species requiring fire for

regeneration. Apart from being of great scientific interest, fynbos is especially valued for preventing soil erosion in mountainous regions.

49. E. Percy Phillips, "A brief historical sketch of the development of botanical science in South Africa and the contribution of South Africa to botany," *South African Journal of Science* 27 (1930): 39–80, especially 60.

50. Bertha Stoneman, *A Book of Verse* (Cape Town: Maskew Miller, 1937).

51. Gunn and Codd, *Botanical Exploration*, 142; P. G. Jordaan, "A. V. Duthie en har bydrae tot die Plantkunde," *Journal of South African Botany* 33 (1967): 47–57, and "Duthie, Augusta Vera (Avie)," in *Dictionary of South African Biography*, vol. 3 (1979), 250–51; Annie Hart and Robert C. H. Hart, eds., *A Memoir of the Reverend Alfred George Duthie, M. C., of Belvidere, South Africa, and of William Henry Moore Duthie of Belvidere, South Africa, together with A Short History of Holy Trinity Church, Belvidere, Knysna, South Africa* (Oxford: Oxford University Press, 1934); Archives, Newnham College, Cambridge; Phillips, "Brief historical sketch," 80 and other short references.

52. Hart and Hart, eds., *Alfred George Duthie*, 62–64, 120.

53. See note 20.

54. The first occupant of the Harry Bolus chair of botany at South African College, Cambridge-educated botanist H. H. W. Pearson (1870–1916) was an enthusiastic and inspiring leader; he built and developed the college's botany department and initiated research in several previously untouched areas, including plant anatomy. An outstanding botanical explorer, he was especially interested in the small but diverse group of gymnosperms known as the Gnetinas, which include tropical vines and trees native to Africa (see Gunn and Codd, *Botanical Exploration*, 275–76).

55. A. V. Duthie, "Anatomy of *Gnetum africanum*," *Annals of Botany* 26 (1912): 593–602.

56. Although Sidney Garside went back to Britain in 1920 and became lecturer at Bedford College, London, he later returned to South Africa; during his retirement he made extensive contributions to the Bolus Herbarium and the University of Cape Town. He died in Cape Town in 1961. See H. M. L. Bolus and J. P. Jessop, "Sidney Garside, M.Sc., F.L.S. (1889–1961)," *Journal of South African Botany* 28 (1962): 231–35.

57. A. V. Duthie, "Some observations of wound healing in a species of oak," *New Phytologist* 12 (1913): 7–12.

58. A. V. Duthie, "Vegetation and flora of the Stellenbosch Flats," *Annals of the University of Stellenbosch* 7, A (4) (1929).

59. A. V. Duthie, "The Eriospermums of the Stellenbosch Flats," *Annals of the University of Stellenbosch* 2, A (3) (1924); "Contribution to our knowledge of the genus *Eriospermum*," *Annals of the University of Stellenbosch* 18, A (2) (1940).

60. A. V. Duthie, "African Myxomycetes," *Transactions of the Royal Society of South Africa* 6 (1917): 293–310; "Studies in the morphology of *Selaginella pumila*, Spring. Part I. The vegetative organs of the sporophyte," *Transactions of the Royal Society of South Africa* 10 (1922): 201–12; "Studies in the morphology of *Selaginella pumila*, Spring. Part II. The cones, spores and gametophytes," *Transactions of the Royal Society of South Africa* 11 (1923): 131–44; "South African Mycetoza," *Journal of the Botanical Society of South Africa* 10 (1924): 7–11; "Studies in the morphology of *Selaginella pumila*, Spring. Part III," *Transactions of the Royal Society of South Africa* 11 (1924): 275–95; "The species of *Isoetes* found in the Union of South Africa," *Transactions of the Royal Society of South Africa* 17 (1929): 321–32; "The method of spore dispersal of three South African species of *Isoetes*," *Annals of Botany* 43 (1929): 411–12; A. V. Duthie and S. Garside, "Studies in South African Ricciaeae. I. Three annual species: *R. plana* Taylor, *R. cupulifera* sp. nov., and *R. curtisii* T. P. James," *Transactions of the Royal Society of South Africa* 24 (1936): 93–133; A. V. Duthie and S. Garside, "Studies in South African Ricciaeae. II. The annual species of the section *Ricciella* (concluded): *R. compacta* sp. nov. and *R. rautanenii* Steph.," *Transactions of the Royal Society of South Africa* 27 (1939): 17–28.

Among Augusta Duthie's other publications are: "Contribution to our knowledge of the Stellenbosch flora. The species of *Anthericum* and *Chlorophytum* of the Stellenbosch Flats," *Annals of the University of Stellenbosch* 4, A (1) (1926); "Contribution to our knowledge of the Stellenbosch flora. The species of *Urginea* of the Stellenbosch Flats," *Annals of the University of Stellenbosch* 6, A (2) (1928); "List of vascular cryptogams and flowering plants of the Stellenbosch Flats," *Annals of the University of Stellenbosch* 8, A (4) (1930).

61. The Aizoaceae (fig-marigold or ice plant family), also referred to as the Vygie family (Afrikaans, from the Dutch *vijg*, meaning fig), come mainly from southern Africa. The family is very large, with about 126 genera and between 1,100 and 2,000 species. The plants are low-growing, herbaceous, at times even woody; many species have brilliant, showy flowers and thrive in hot, dry locations in poor, sandy soils. See www.members.tripod.com/~mesembry/html/mesembs/index.htm (April 2009).

62. Margaret R. Levyns, "H. M. L. Bolus, (1877–1970)," *Journal of South African Botany* 36 (1970): 319–29; Brown, "Amateur Scientist," in *History of Scientific Endeavour in South Africa*, 458 (portr. 459); Miriam P. de Vos, "Bolus, Harriet Margaret Louisa (Lulu)," in *Dictionary of South African Biography*, vol. 5 (1987), 60–61.

63. The Collegiate High School, founded in 1874 as a private, fee-paying, nondenominational school for girls, was established by a group of progressive Port Elizabeth residents who wanted to provide girls with an education comparable to that available at the best girls' schools in England. In 1900 it was placed under the control of the Cape Education Department. A Junior School opened in 1928. Now more than 130 years old, the high school, since 1966 in a beautiful, spacious site in the Port Elizabeth suburb of Parsons, maintains its long tradition of overall academic excellence, with a modern senior science laboratory, computer center, etc. See www.cghs.co.za/ (April 2009).

64. In his essay on the history of botany in South Africa, published in 1930, E. Percy Phillips, then principal botanist at the Division of Plant Industries, Pretoria, said of Harry Bolus (1834–1911) that he is “the outstanding figure in South African botany.” A successful English businessman, later stockbroker, Bolus emigrated from England to South Africa in 1850. After five years in Grahamstown, he moved inland to Graaf Reinet, where he spent the next twenty years. With help and some instruction from two botanist friends, Francis Guthrie and Peter McOwan, he began a thorough study of local flora, building up his own collections and entering into much correspondence with London botanists. Later he moved to Cape Town, which became the center of most of his botanical work. See Phillips, “Brief historical sketch,” 48–49.

65. See note 9.

66. Among Louisa Bolus's heath papers were: “South African heaths,” *Journal of the Botanical Society of South Africa* 8 (1922): 18–20; “The lesser red heath (*Erica fervida*, L. Bolus),” *South African Gardening and Country Life* 16 (1926): 75; “Yellow-petticoat heath (*Erica thunbergii*, Montin.),” *South African Gardening and Country Life* 17 (1927): 158; “Walker's heath (*Erica walkeria*, Andr.),” *South African Gardening and Country Life* 17 (1927): 257; “Mealie heath (*Erica abietina*, L.),” *South African Gardening and Country Life* 19 (1929): 189; “Sticky white heath (*Erica physodes*, L.),” *South African Gardening and Country Life* 19 (1929): 387, 392.

67. Bolus, *Icones Orchidearium*, ed. H. M. L. Bolus; H. Bolus, *The Orchids of the Cape Peninsula*, ed. H. M. L. Bolus and A. M. Greene (Cape Town: Darters, 1918).

68. H. M. L. Bolus, “South African orchids,” *Annals of the Bolus Herbarium* 4 (1925): 31–36; 4 (1926): 62–67.

69. See note 61.

70. These descriptions by Louisa Bolus appeared in H. H. W. Pearson, “List of plants collected in the Percy Sladen Memorial Expeditions, 1908–09, 1910–11,” *Annals of the South African Museum* 9 (1911–1918): 131–58, 160–70, 175, 178–83.

71. Situated about six and a half miles south of Cape Town city center on the eastern slopes of Table Mountain, the spectacular Kirstenbosch gardens are widely recognized as “one of the ‘Seven Magnificent Botanical Gardens of the World.’” Presented there are unique displays of the region's diverse fynbos flora, wide stretches of natural forest, and, among other particularly notable plantings, a rich collection of southern African cycada, survivors of the earth's ancient gymnosperm population. See Susan Mahr, “Kirstenbosch Botanical Gardens,” Horticultural Information Page. Archived Feature Article, www.hort.wisc.edu/mastergardner/ (Feb. 2009).

72. H. M. L. Bolus, *Elementary Lessons in Systematic Botany Based on Familiar Species of South African Flora* (Cape Town: T. Maskew Miller, 1919); *A Book of South African Flowers*, paintings by Dorothy Barclay and photographs by E. J. Steer (Cape Town: Specialty Press, 1925); *A Second Book of South African Flowers*, paintings by Dorothy Barclay and photographs by E. J. Steer (Cape Town: Specialty Press, 1936).

73. For a list of Louisa Bolus's publications see Levyns, “H. M. L. Bolus, (1877–1970),” 325–29, list compiled by J. P. Jessop of the Botanical Research Institute, Pretoria.

74. M. Hoskyn, “Stephens, Edith Layard,” in *Dictionary of South African Biography*, vol. 4 (1981), 613–14; Enid du Plessis, “Edith Layard Stephens,” *Journal of the Botanical Society of South Africa* 54 (1968): 42–47; K. M. F. Scott, “Obituary. Edith Layard Stephens,” *Newsletter—Limnological Society of Southern Africa*, October 1966; Margaret R. Levyns, “Edith Layard Stephens,” *South African Forum Botanicum* 4, no. 4 (1966): 2–3; W. Ritchie, *The History of South African College, 1829–1918*, 2 vols. (Cape Town: T. Maskew Miller, 1918), vol. 2, 512, 528, 600; Phillips, “Brief historical sketch,” 72; Newnham College Archives; notes in technical papers. I thank especially Mrs. Janine Dunlop, librarian and archivist, University of Cape Town, for information from Edith Stephens correspondence files concerning Stephens's 1935 visit to London.

75. For information on Rustenburg Girls' High School see www.rghs.org.za (June 2009).

76. See note 54.

77. See also the section on Augusta Vera Duthie (above); Duthie studied at Cambridge in 1912.

78. E. L. Stephens, “A preliminary note on the embryo-sac of certain Penaeaceae,” *Annals of Botany* 22 (1908): 329–30; “The embryo-sac and embryo of certain Penaeaceae,” *Annals of Botany* 23 (1909): 363–78; “Embryo-sac and embryo of *Geissoloma marginata*,” *New Phytologist* 8 (1909): 345–48.

79. E. L. Stephens, "The development of the seed-coat of *Carica papaya*; with four figures in the text," *Annals of Botany* 24 (1910): 607–10; E. L. Stephens and M. G. Sykes, "Preliminary note on apogamy in *Pteris droogmantiana*," *Annals of Botany* 24 (1910): 487.

80. E. L. Stephens, "Recent progress in the study of the embryo-sac of the angiosperms," *New Phytologist* 8 (1909): 377–87.

81. For a biographical sketch of Ethel Sargent see Creese, *Ladies in the Laboratory?* 44–46, and "Sargent, Ethel (1863–1918)," in *ODNB*, 48 (2004), 960, slightly revised in online ed., 2004–2007, www.oxforddnb.com/view/article/37935 (Jan. 2007).

82. E. L. Stephens, "A new species of *Haematoxylon* (Leguminosae-Caesalpinieae) from Namaqualand," *Transactions of the Royal Society of South Africa* 3 (1912): 255–57.

83. Pearson, "Percy Sladen Memorial Expeditions." Contributions from Edith Stephens appear on the following pages: with H. H. W. Pearson, "Portulacaceae," 30–35, "Capparidaceae," 35–39, "Polygalaceae," 39–40; with J. Hutchinson and Ruth Glover, "Sterculiaceae," 195–98. (Ruth Glover, a member of the group led by Edith Stephens to collect in the Olifants River valley, was a worker in the Bolus Herbarium. Kew Gardens botanist John Hutchinson had strong interests in South African botany and went on several expeditions.) See also Pearson's introductory remarks, 1–3, and 129–30.

84. E. L. Stephens, "The structure and development of the haustorium of *Striga lutea*," *Annals of Botany* 26 (1912): 1067–76; "Note on the anatomy of *Striga lutea*, Lour.," *Annals of Botany* 26 (1912): 1125–26.

85. See for instance F. E. Fritsch and Florence Rich, "Contributions to our knowledge of the freshwater algae of Africa. Pt. 4. Freshwater and subaerial algae from Natal," *Transactions of the Royal Society of South Africa* 11 (1924): 297–389; Florence Rich, "Contributions to our knowledge of the freshwater algae of Africa. Pt. 10. Phytoplankton from South African pans and vleis," *Transactions of the Royal Society of South Africa* 20, no. 2 (1932): 149–88; Florence Rich, "Some desmids from the Transvaal," *Transactions of the Royal Society of South Africa* 27, no. 2 (1939): 1–15.

86. F. E. Fritsch and E. Stephens, "Contributions to our knowledge of the freshwater algae of Africa. Pt. 3. Freshwater algae (exclusive of diatoms) mainly from the Transkei Territory, Cape Colony," *Transactions of the Royal Society of South Africa* 9 (1921): 1–72. Naturalist Alice Marguerite Pegler (1861–1929), who collected the fungi discussed in this paper, was a resident of the village of Kentani, about forty miles north of East London. The daughter of S. Macklin Pegler, she was born in Keiskammahoe, Cape Province, on 21 July 1861. Educated at the Dominican Convent, King William's Town, some fifty miles inland from East London, she trained as a teacher. She was never very robust and gave up her profession early, settling in Kentani, where she brought up and educated her nieces. Pegler was one of the amateurs who made important contributions to late nineteenth- and early twentieth-century botanical investigation in South Africa; she collected extensively, mainly within a radius of about five miles of Kentani, but also around Johannesburg and Rustenberg during a visit to the Transvaal in 1903. She corresponded with the leading botanists in South Africa, including Harry Bolus and Henry Harold Pearson. In 1916 she published the first part of her observations, "On the flora of Kentani" (*Annals of the Bolus Herbarium* 2 (1916): 1–14); a second part appeared in 1918. The herbarium she built up at Kentani numbered over two thousand specimens; she also collected insects and arachnids, including scorpions. Over the years her duplicate specimens were donated to various herbaria, mainly in South Africa, but some went to Kew. As her health deteriorated she turned her attention more and more to algae and fungi. Alice Pegler died in Umtata, Transkei, on 17 June 1929, after seven years as a helpless invalid. See Gunn and Codd, *Botanical Exploration*, 277–78.

87. A. Braun, "Die Characeen Afrika's," *Monatsberichte der Königlich Preussischen Akademie der Wissenschaften zu Berlin* (Dec. 1867): 782–800, 873–944. Alexander Carl Heinrich Braun (1805–1877) is remembered especially for his work in developing comparative morphology as a tool in systematic botany. He was also a notable collector and discovered several species of cryptogams; charophytes from various parts of the globe occupied his attention over many years. The herbarium he left after his death contained the most complete existing collection (twenty-six bundles) of the group at that time. The species *Chara braunii* (Braun's stonewort) bears his name. See Robert Caspary, "Alexander Braun," *Journal of Botany, British and Foreign* 15 (1877): 321–27.

88. James Groves and Edith L. Stephens, "New and noteworthy South African Charophyta," *Transactions of the Royal Society of South Africa* 13, no. 2 (1926): 145–58; "New and noteworthy South African Charophyta," *Transactions of the Royal Society of South Africa* 21, no. 3 (1933): 271–89.

89. See B. C. Kundu, "Guy Oldfield Allen," *Taxon* 14 (1965): 206–7.

90. Leslie E. Kent and Edith L. Stephens, "*Chara rotunda*: A new South African fossil charophyte," *Transactions of the Royal Society of South Africa* 31, no. 4 (1947): 381–88.

91. Edith L. Stephens, "South African species of water-net (*Hydrodictyon*)," *Transactions of the Royal Society of South Africa* 13 (1926): xviii.

92. Edith L. Stephens, "*Microcystis toxica*, sp. nov. A poisonous alga from the Transvaal and Orange Free State," *Hydrobiologica* 1, no. 1 (1948): 14, and *Transactions of the Royal Society of South Africa* 32, no. 1 (1949): 105–12.

93. F. W. Fox and Edith L. Stephens, "Agar from South African seaweeds," *South African Journal of Science* 39 (1943): 147–49 [abstract].

94. Edith L. Stephens, "Freshwater aquatic vegetation of the south-western districts," in *The Botanical Features of the South-Western Cape Province* (Cape Town, Wynberg: Specialty Press of South Africa, 1929), 81–95.

95. Edith L. Stephens, "A new Sundew, *Drosera regia* (Stephens), from Cape Province," *Transactions of the Royal Society of South Africa* 13 (1926): 309–12; "Notes on three South African terrestrial Ultriculariae," *Journal of South African Botany* 4, no. 2 (April 1938): 47–51.

96. Duthie, "Species of Isoetes," *Transactions of the Royal Society of South Africa* 17 (1929): 321–32.

97. Edith L. Stephens, *Some South African Edible Fungi* (Cape Town: Longman's Southern Africa, 1953, 1968), illustrations by Mary Matham Kidd, foreword by Arthur Anselm Pearson, Longman's Field Handbooks Series; *Some South African Poisonous and Inedible Fungi* (Cape Town: Longman's Southern Africa, 1953, 1968), illustrations by Mary Matham Kidd, foreword by Arthur Anselm Pearson, Longman's Field Handbooks Series.

98. Mary Matham Kidd's best-known work was her collection of Cape wildflower paintings, *Wild Flowers of the Cape Peninsula* (Cape Town: Oxford University Press, 1950, 1973). With ninety-one colored plates, each presenting a group of plants organized by month of blooming and type of habitat, it included descriptive notes for each plant in the group. About 814 species were illustrated, many of them especially interesting to non-South African flower enthusiasts because of their strange and unusual forms. An excellent foreword that presented a summary of the unique qualities of South Africa's floral riches was provided by Field Marshal Jan Christian Smuts, a much-respected amateur botanist, although remembered more as a soldier and statesman.

99. For a short account of Dame Helen Gwynne-Vaughan see Creese, "Vaughan [*née* Fraser], Dame Helen Charlotte Isabella Gwynne-Vaughan (1879–1967)," in *ODNB*, 56 (2004), 167–69, and in online edition 2004–2007, www.oxforddnb.com/view/article/33623 (April 2009).

100. Levyns, "Edith Layard Stephens," 3.

101. See du Plessis, "Edith Layard Stephens," 43, quoting Margaret Levyns.

102. Edith L. Stephens, "A new and poisonous agaric from the Cape Peninsula," *Journal of South African Botany* 32, no. 1 (1966): 61–66.

103. Distinguished Latvian phycologist Heinrichs Skuja (1892–1972), who worked at the University of Uppsala from 1944 until 1960, was well known for his wide-ranging studies of the algae of the Baltic and the lakes of Latvia and Sweden. He also worked on materials brought back by expeditions to various parts of the world, including the Southern Hemisphere. See the description of the Heinrichs Skuja Prize in "Latvian Academy of Sciences," ww3.lza.lv/docs/prizes.htm (April 2009). Charles Joseph Chamberlain (1863–1943), professor of morphology and cytology at the University of Chicago from 1915 to 1929, specialized in the study of cycads, using cytology and histology to establish lineages of living cycads. He visited South Africa during a 1911–1912 trip to regions in the Southern Hemisphere. See "Chamberlain, Charles Joseph, 1863–1943, American botanist," in *Navigational Aids for the History of Science, Technology and the Environment*, www.nahste.ac.uk/isaar/GB_0237_NAHSTE_P0573.html (April 2009).

104. See report of the African Astronomical History Symposium held in Cape Town, 8 & 9 November 2005, *African Skies / Cieux Africains* no. 11 (July 2007): 1–60. Topics covered at this symposium included /Xam Bushman cosmology, comets in Bushman paintings, Xhosa celestial nomenclature, and the beliefs held in the Setswana linguistic region concerning the Moon and Venus.

105. R. H. Stoy, "Astronomy in South Africa," in *History of Scientific Endeavour in South Africa*, 409–26; Patrick Moore and Pete Collins, *The Astronomy of Southern Africa* (London: Robert Hale & Co., 1977); Sir David Gill, *A History and Description of the Royal Observatory, Cape of Good Hope* (London: His Majesty's Stationery Office, 1913); South African Astronomical Observatory, History website, www.saa.ac.za/about/history/ (April 2009).

106. A. M. Clerke, revised David S. Evans, "Fallows, Fearon (1788–1831)," in *ODNB*, online ed., www.oxforddnb.com/view/article/9127 (July 2006); "Fallows, Fearon, Reverend," Astronomical Society of Southern Africa, Historical Section, www.assa.saa.ac.za/assa/html/his-astr-fallows_f.html (April 2009).

107. Moore and Collins, *Astronomy of Southern Africa*, 44–45.

108. Scottish astronomer Sir David Gill was director of the Cape Royal Observatory from 1879 to 1907; see F. W. Dyson, revised Hermann A. Brück, "Gill, Sir David (1843–1914)," in *ODNB*, online ed., May 2006, www.oxforddnb.com/view/article/33404 (July 2006).

109. Gill, *History and Description*, xiii.

110. “Results of the observations made by the Rev. Fearon Fallows, at the Royal Observatory, Cape of Good Hope, in the years 1829, 1830, 1831. Reduced under the superintendence of G. B. Airy, Esq., Astronomer Royal,” *Memoirs of the Royal Astronomical Society* 19 (1851): 1–102.

111. Agnes M. Clerke, “Southern star spectra,” *Observatory, London* 11 (1888): 429–32; “Some southern red stars,” *Observatory, London* 12 (1889): 134–36. For a recent biography of Agnes Clerke see Mary Brück, *Agnes Mary Clerke and the Rise of Astrophysics* (Cambridge, UK: Cambridge University Press, 2002).

112. A short announcement, presumably from a Cape Town newspaper of the time, reads as follows: “Vacancies exist at the Royal Observatory for girl computers, J. C. standard; commencing salary £9 p.m. plus COLA at present £2/16/8; hours 9–1 and 2–3:30; neatness and accuracy in figures essential.—Apply in writing to secretary.”; see South African Astronomical Observatory, History website (note 106). An effort to establish the origin of this announcement was not successful.

113. Gill, *History and Description*, clxvii.

114. Gill, *History and Description*, clxxi, clxxii. Names are listed (generally as last name and initials) in tables headed “Clerkes or Computers” and “Ladies employed on Astrographic Measures, etc.” A photograph of the observatory staff at this period appears in Moore and Collins, *Astronomy of Southern Africa*, 80. Efforts to find out more about the women computers were unsuccessful.

115. See for instance Robert N. Campbell, “Early astronomy in Otago,” *Southern Stars* 40, no. 1 (2001): 12–13.

116. A. W. Long, “The foundation and development of the Astronomical Society of Southern Africa,” *Journal of the Astronomical Society of South Africa* 2 (1930): 153–80; H. E. Houghton, “Some southern African amateur astronomers,” *Monthly Notes of the Astronomical Society of South Africa* 6, no. 6 (1947).

117. Information about the Johannesburg center came from Long, “Foundation and development,” and Houghton, “Southern African amateur astronomers.”

118. Ritchie, *History of South African College*.

119. Pieter Maritz, “Sir Thomas Muir, 1844–1934,” *Linear Algebra and Its Applications* 441 (2005): 3–67, especially 11, 13, 15, 16; “Athelstan Spilhaus,” interviews by E. H. Douglass, J. B. Platt, J. B. Rae, A. A. Focke, and J. A. Campbell. Tape recording, Claremont, California, 10, 11, and 12 February 1975. Honnold Library, Claremont Graduate University, online at <http://hip.cgu.edu/brodie/b2.html> (Feb. 2009).

120. Nellie Muir Spilhaus’s son Athelstan Frederick Spilhaus (1911–1998) had a distinguished career in physical oceanography and meteorology, mostly at the Woods Hole Oceanographic Institution, Massachusetts, and a succession of American universities. His work on submarine detection systems in the Second World War was especially notable. Recipient of many honors, including twelve honorary degrees, the Legion of Merit, and the United States Exceptional Civil Service Medal, he held various government appointments, serving as the first U.S. representative on the UNESCO Executive Board and later (1966–1972) on the National Science Board. See William A. Nierenberg, “Athelstan Spilhaus, 25 November 1911–30 March 1998,” *Proceedings of the American Philosophical Society* 144, no. 3 (2000): [344]–[347].

Chapter Two

Australia

Desert Flowers, Tropical Birds, Dry Plains, and Clear Seas

Of the nine Australian women whose publications are listed in the Royal Society's *Catalogue*, five were university-trained people who began their research in the last decade of the century: Sarah Brennan, Laura Forster, Ada Lambert a'Beckett, Florence Martin, and Georgina Sweet. The others were amateurs also writing in the 1890s, except for one, whose short observational report appeared in 1861 (refer to figure I.1, a, in the introduction).¹ Also discussed are eleven women collectors and artists, several of whom made notable contributions to the early exploration and recording of Australia's flora and fauna.

Although initial European contacts with Australia and the first coastline exploration and mapping were carried out by the Dutch starting about 1606, nearly two centuries were to lapse before any lasting settlement was attempted. Unlike the Cape of Good Hope, at a strategic location on the shipping route from Europe to the Far East, the Australian north and west coasts did not present stopping places of any special advantage to the captains of the Dutch East India Company trading with the Indonesian islands. About 1769, however, the British made their entry into the early history of European settlement in Australia. That year, Royal Navy lieutenant James Cook, on the bark HMS *Endeavour*, continued his trans-Pacific voyage after his assigned observational work in Tahiti on the transit of Venus; he reached and circumnavigated New Zealand and continued west until he sighted southeastern Australia. Cook explored and mapped the eastern coastline, claiming the region for Britain and naming it New South Wales. Other British navigators, including George Bass and Matthew Flinders, continued the coastline mapping, and a nearly completed map of the continent plus Van Diemen's Land (Tasmania) was published in 1814.

Cook's explorations of 1769–1770 and the reports of fertile land brought back by the *Endeavour*'s botanists, Joseph Banks and Daniel Solander, led to the first European settlement on Australian soil, the British penal colony at Port Jackson (now part of Sydney), which followed the well-known initial landing at Botany Bay. Started in 1788 with the arrival of eleven ships called the First Fleet, the colony had many setbacks and difficulties, but a few free settlers began to arrive from about 1793. Other colonial ventures followed, in Van Diemen's Land in 1804–1805, in the Swan River region (Western Australia) in 1829, and in South Australia in 1836. The first attempt at settlement in Victoria, then part of New South Wales, came in 1803, but only in 1834 was a permanent colony established at the site that is now the city of Melbourne. Victoria became a separate province in 1851, a move that was followed by the separation of Queensland from New South Wales in 1859, although a penal colony near the site of what became Brisbane dated from 1824 (figure 2.1).²

The reports of Australia's beautiful native flora and unknown fauna brought back by the early navigators quickly caught the attention of European naturalists. In Britain the collections of botanist Joseph Banks from the *Endeavour* voyage were especially influential in stimulating interest. Other naturalists, British and continental, followed, and within a few decades large collections of Australian materials were building up in museums in London, Paris, and Vienna. Among the collectors who supplied these museums were a few women; the stories of some of them are sketched below.



Figure 2.1. Australia (states) and New Guinea.

INDEPENDENT CONTRIBUTORS

Explorers and Collectors

GEORGIANA MOLLOY,³ née KENNEDY (1805–1843), collected plants and seeds in the southwestern region of Western Australia from the mid-1830s until 1842—that is, within less than half a decade of the establishing of the colony of Western Australia. Born on 23 May 1805 near Carlisle, Cumberland, Georgiana was one of five children of David Kennedy of Crosby Lodge and his wife, Mary, both of whom were descended from old Border families. Her education, typical for a young lady of the time, gave her a good knowledge of English literature and proficiency in such areas as drawing, painting, music, and embroidery. Although she lacked any formal botanical knowledge, flowers and gardens became special interests.

In 1829 she married Captain John Molloy (1789–1867), a veteran of the Napoleonic Wars, an Oxford-educated man twenty-four years her senior. Captain Molloy's parentage is uncertain, but tradition has it that he was descended from an illegitimate son of the Duke of York, brother of King George III. Shortly after the marriage, the Molloys, with household possessions and eight servants, emigrated to Western Australia, where Molloy expected to begin a new life as a gentleman farmer. After a short stay in Freemantle, where they landed in March 1830, they moved about 160 miles south to a rough settlement at Augusta, at the mouth of the Blackwood River (figure 2.2). Here John Molloy, by then appointed a justice of the peace, was also the resident magistrate.

Over the next five years Georgiana gave birth to three children in extremely primitive conditions. For relief from the harsh realities of settler life she turned to flowers, her old love, at first cultivating familiar European varieties, the seeds of which she had brought with her. But she soon found even greater enjoyment in the indigenous plants growing all around her, and she pressed and mounted collections in a *hortus siccus* also brought from England. In 1836, through the good offices of a mutual friend, she was contacted by British amateur botanist Captain James Mangles, R.N., who had himself visited the Swan River settlement a few years previously. Along with his request that she send him seeds of native plants of her district came a box of seeds of European flowers. Very aware of her lack of botanical training and knowledge, she doubted her ability to fulfill his request but nevertheless promptly collected and sent a box of seeds and books of pressed dried plants. Unable to give names, she offered instead careful, written descriptions.

She was glad to have an occupation that provided a steady interest apart from the constant labor of daily life in newly settled country, and she kept up her contacts with Mangles, although the turnaround time for their communications could be as much as a year. As time went on, her two small daughters, Sabina and Mary Dorothea, joined in the collecting, and occasionally John Molloy found time to assist as well. Mangles provided her with reference books and the supplies and materials she needed, along with more European seeds, and she responded with Australian seeds and pressed plants. These Mangles gave to nurserymen, botanists, and various botanical gardens in Britain. Many of the plants propagated from Georgiana Molloy's seeds were previously unknown to European botanists. Unlike some other consignments from the antipodes, her seeds and plants were carefully packed and retained their freshness—no trivial matter for the botanists who received them. Further, every *hortus siccus* she sent was a work of precise mounting and careful description; some are still held at the Kew Gardens herbarium. Over the years her contributions to botanical and horticultural science in Britain were considerable, despite the many other demands on her time; her homestead and neighborhood responsibilities required energy and initiative, especially when John Molloy's duties as resident magistrate took him away for long periods.

In 1839 the Molloys moved from Augusta to a settlement on the Vasse River forty miles to the north. Two years earlier most of the Augusta families had moved to the Vasse, hoping to find land easier to develop than the beautiful but heavily forested country at Augusta. John Molloy took up 12,000 acres and built the homestead of Fair Lawn, while once again serving as resident magistrate for the district. Georgiana, although heartbroken at leaving her first garden in Augusta, established a second at Fair Lawn, one that became famous throughout the colony and attracted the attention of botanists working in the region. James Drummond, curator of the Botanic Gardens in Cork, Ireland, until he emigrated to Western Australia in 1829, visited Fair Lawn, and German botanist Ludwig Preiss, in the course of his extensive botanical explorations in Western Australia (1838–1842), was Georgiana's guest for a month, during which he significantly increased his collections.

Georgiana Molloy died on 8 April 1843, a few weeks before her thirty-eighth birthday, having been bedridden since the previous December following the birth of her sixth child. Of these six children, four daughters reached adulthood.

Her collecting contributions were not acknowledged in scientific journal articles describing her materials, and for more than a hundred years after her death her name hardly ever appeared in accounts of the development of Australian botanical science; a brief mention in George Bentham's still-basic reference work *Flora Australiensis* (1863–1878) would appear to be an exception. In the mid-1950s she was

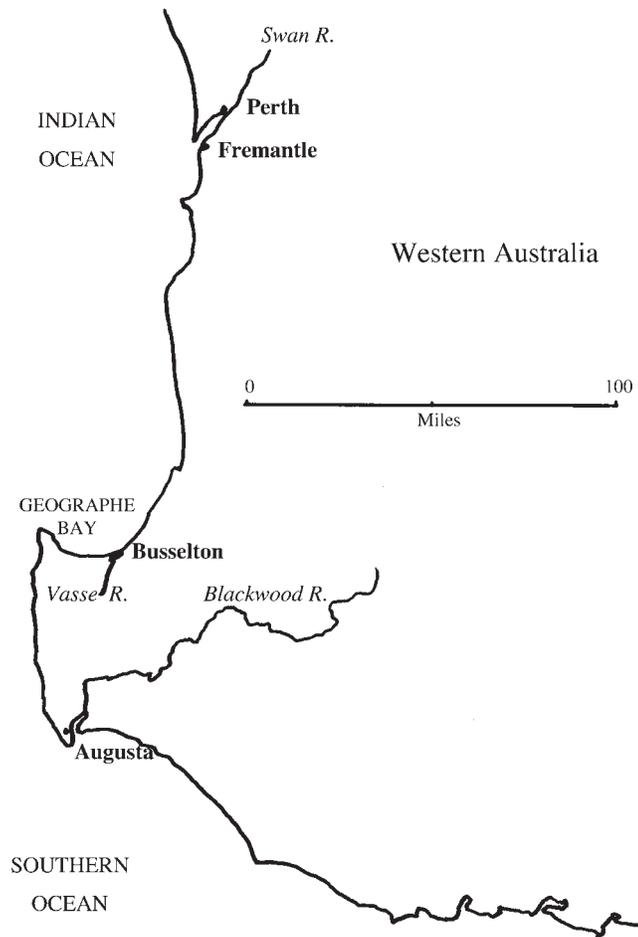


Figure 2.2. Western Australia, southwest coast.

rediscovered and her story brought back to light in two separate works, Marnie Masson Bassett's *The Hentys* and social historian Alexandra Hasluck's biography, *Portrait with Background*.⁴ A bright, vigorous, and courageous young woman, during her short botanical career Georgiana Molloy made important contributions to exchange and communication as well as to her native country's showpiece gardens and major herbaria. *Boronia molloyae* Hook. is named after her; a species of dwarf Australian shrub of the rue family that produces dense clusters of small, pleasant-smelling, red or purple flowers in the spring, it is one of only a few Australian plants named after a woman. There is now a Georgiana Park and Molloy Memorial in Augusta, and in Busselton, the town near the Molloy's Vasse River homestead, Georgiana is commemorated in the name of the Georgiana Molloy Anglican School.

Some two decades later, another early woman naturalist-collector was beginning her Australian work on the other side of the continent, in vastly different climatic conditions. For almost a decade in the 1860s and 1870s AMALIE DIETRICH,⁵ née NELLE (1821–1891), collected the rich flora and exotic fauna of tropical Queensland, amassing vast quantities of material, most of which was promptly dispatched back to her native Germany. Rich in species new to European biologists, Dietrich's collections covered a wide range. All plant forms were represented; her spider collection, the first significant collection of Australian spiders, constituted an especially important part of her entomological contributions.⁶ She also assembled the largest collection of Australian birds made by any one person; marsupials, fishes, sea slugs, marine algae, and some of Australia's deadliest snakes were among her other contributions.

Her entomological materials brought her membership in the well-established Stettin Entomological Society, and a collection of her Australian woods won a gold medal at a Hamburg exhibition. Further, Dietrich's contributions continued to be used as important markers in the taxonomy of some biological groups for well over a century.

Despite this honorable record, Dietrich's influence on the growth of European knowledge of Australia's natural history has remained relatively unknown compared to that of most male naturalist-explorers whose contributions were of comparable magnitude. As a female, of working-class origin and without any formal education, her position was inevitably at the outer edge of the scientific establishment, then generally the province of middle-class men. Since she never brought out any report of her own, her name is given only as the collector in the publications of those who used and described her materials. Until relatively recently she was known for the most part through the book published by her daughter almost two decades after her death.⁷ Although initially recognized by those who knew Dietrich as very much a biographical novel, the book was a great literary success, running to many subsequent editions.⁸ A sentimental and idealized story of Dietrich's life and work, it depended heavily on the daughter's imagination (helped by the published accounts of at least one other naturalist-explorer of Australia's northeast coast⁹). Despite its numerous errors and inaccuracies, both geographical and scientific, it remains a basic source of information about Dietrich but must be used with caution by students of history.

Amalie Dietrich was probably the first woman to earn a living as a collector of flora and fauna in Australia. She worked for the prosperous Hamburg trading and shipbuilding firm of J. C. Godeffroy & Sohn, collecting material for the Godeffroy Museum. By the 1860s, a time of marked German colonial expansion, Godeffroy trading routes extended to the Pacific region, including Australia. The large quantities of exotic, hitherto unknown biological specimens and ethnographic artifacts brought back to Hamburg by Godeffroy captains and traders led to the establishing of a private museum to house growing collections. The head of the firm, Johan Cesar VI Godeffroy, a well-educated man with a lively interest in natural history, was very aware of the importance of the collections and soon began to employ men of scientific background as collectors. A number of important reports resulting from studies of the museum holdings, which were open to scientists, appeared in the publication *Journal des Museum Godeffroy*; the museum flourished until the financial collapse of the parent firm in 1879.

Konkordie Amalie Nelle (Amalie Dietrich) was born on 26 May 1821 in the village of Siebenlehn, Saxony, about twenty miles west of Dresden, the younger child of Gottlieb Nelle and his wife, Johanna. Nelle, a skilled craftsman who made leather goods, was able to support his family comfortably. Johanna Nelle was forty-three when Amalie was born and formed an especially close relationship with her only daughter. Amalie's formal education was limited to a few years in the village school, but from her mother she learned the traditional folk wisdom about wild plants and herbs and their beneficial properties, knowledge she used throughout her life.

In 1846 Amalie married Wilhelm August Salomo Dietrich; having had to abandon hopes of becoming a physician, Dietrich had taken up pharmacy and was then working as the Siebenlehn apothecary. His abiding interest was natural history, particularly botanical studies. Soon after the marriage, Dietrich decided to give up pharmacy; he and Amalie would earn a living by collecting and selling plant specimens to professors, students, apothecaries, and collectors. Since they shared their house with Amalie's parents, Amalie was free to leave domestic work to her mother. Traveling through Saxony, northern Germany, and the Netherlands, they collected plants, insects, and some minerals. Amalie was an eager student, keen to expand the basic plant knowledge she already had; over the course of the work she readily absorbed the good training in the elements of natural history that Dietrich offered her, including an introduction to the Linnean system of nomenclature. Despite sales being unreliable, Amalie continued to travel from city to city offering collections, even after the birth of daughter Charitas in 1848. Latterly she went alone, Wilhelm Dietrich choosing to remain at home doing sorting and identification. Her specimens were carried in a heavy dogcart, pulled by her dog Hector, for whom she had a great affection. As time went on, her contacts with professors and students expanded, her friendship with members of the naturalist community deepened, and her own botanical knowledge benefited richly.

About 1861, following a period of infidelity on Wilhelm's part, the Dietrichs separated, Wilhelm having taken a position as tutor in a nobleman's family. There being no provision for Amalie and her daughter in this arrangement, she decided to continue her work of plant collecting and selling, making a living as best she could. Two years later she applied for and obtained a salaried position, her credentials and letters of recommendation from well-known naturalists having sufficiently impressed Johan Cesar VI Godeffroy.

The agreement between Godeffroy and Amalie Dietrich to explore in the barely settled wilds of northern Queensland in the 1860s is remarkable both for Godeffroy's perception and his confidence in taking on a woman, and for Dietrich's courage, enterprise, and trust in her own abilities. For a European woman to undertake independent work in largely unexplored tropical regions, without a nearby base of operations or a support point of family or friends, was remarkable in the 1860s; Dietrich's venture came a generation before Britain's Mary Kingsley took on much shorter but in some ways comparable undertakings in tropical West Africa.

Given a ten-year contract, Amalie was taught taxidermy, provided with a supply of food staples, equipment, and reference books, and instructed in the art of handling firearms. She left her fifteen-year-old daughter in the charge of well-to-do friends but made arrangements to send the girl to a boarding school, the fees to be paid out of her collector's salary. Sailing on Godeffroy's fast clipper ship *La Rochelle*, she arrived at Moreton Bay harbor in August 1863. Of the 445 passengers on the ship she was the only one traveling first class; the others were German farmer immigrants joining the already significant numbers of German agricultural workers taking advantage of early Queensland immigration programs and generous land grants. Some of these settler families in small, isolated German communities would become Dietrich's friends and helpers over the succeeding years.

Concentrating initially on the region's luxuriant plant life, she collected over six hundred species around Moreton Bay and the Moreton Bay settlement, now Brisbane. Her resulting shipment to Hamburg included enough multiple specimens so that, after identification was completed by H. G. Reichenbach of the Hamburg Botanic Gardens, the Godeffroy Museum was able to publish its first botanical sale catalog. Titled *Neuholländische Pflanzen, gesammelt von Frau Amalie Dietrich am Brisbane River, Col. Queensland in Auftrage der Herren Joh. Ces. Godeffroy & Sohn in Hamburg*, it listed 235 species of flowering plants (phanerogams) and twenty-seven species of cryptogams, the nonflowering plants such as the mosses, fungi, and ferns. These specimens and many more that followed formed the basis of Luerssen's "Zur Flora von Queensland," published in the museum's journal, and also of works by botanist Karl Domin.¹⁰ Dietrich's Australian mosses, many from the Brisbane region, were analyzed by the celebrated bryologist Karl Müller of Halle, later professor in Munich; Müller and his family were old friends of hers from her days of collecting and selling European species.¹¹ Other materials from the Brisbane area included small numbers of insects, amphibians, birds, and mammals.

From Brisbane, where she probably stayed for about two years, Dietrich worked her way north along the coast, driving a horse and cart. She stayed for a time in Rockhampton, where one of her especially notable acquisitions was a specimen of a previously unknown large snake named *Pseudochis scutellatus* (now *Oxyuranus scutellatus*), the world's third-most venomous species. By 1867 she had reached Mackay, then a frontier settlement of about 340 people; there she obtained skins of large crocodiles caught in the Pioneer River near the town. At the small settlement of Lake Elphinstone, a pastoral station about fifty-five miles inland from Mackay (figure 2.3), Dietrich spent almost a year with the German settler families of John George Hess and his younger brother George Michael Hess and formed a close friendship with George's wife, Rosina. The shallow lake in the area was a haven for many species, including small reptiles and mammals, but most of all for birds. Of the 266 species of Australian birds Dietrich collected (at least half of the species known in Queensland), 116 were from Lake Elphinstone.¹²

Dietrich's longest stay, almost three years, was in the recently established community of Bowen, the most northerly point she reached along the Queensland coast. With nearly seven years of Australian experience behind her, she had by then acquired new and well-merited confidence in both her own abilities as naturalist and collector and her facility to communicate in English. Apart from the clearly

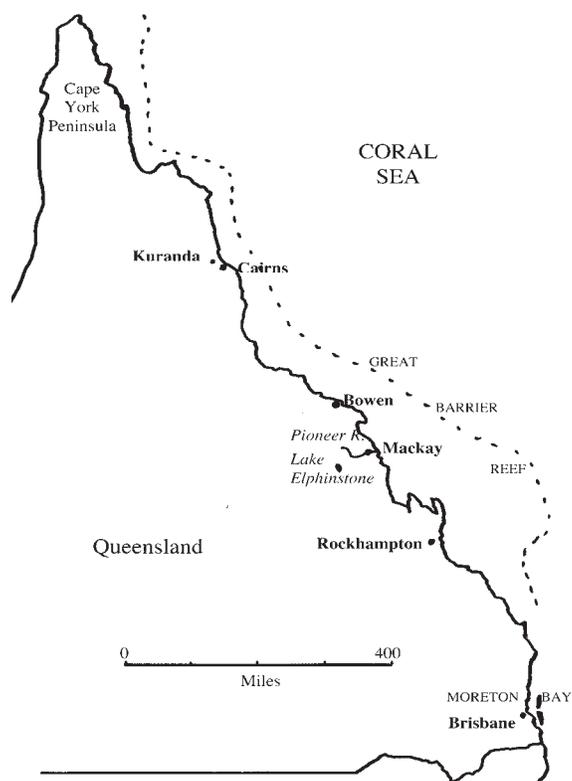


Figure 2.3. Queensland coast.

expressed approval of Godeffroy, she had received notable recognition in Europe; this included her 1867 election to fellowship in the Stettin Entomologischer Verein and the same year her first prize and gold medal at the Paris Universal Exhibition for a collection of Australian woods.

Despite its small population in 1870, the frontier settlement of Bowen was home to a surprising number of very active and dedicated naturalists. These included the Irish botanist Eugene Fitzalan, a skilled collector and a friend of Ferdinand von Mueller, director of Melbourne Botanic Gardens; the town's harbormaster, Frederick Kilner, known for his collections of marine algae, would also become Dietrich's friend and adviser. Although she had a small canoe of her own, it appears likely that at least some of her marine specimens, including algae and many species of Holothurians (sea slugs), were collected with Kilner's cooperation.¹³ Yet another member of the Bowen naturalists' circle who probably advised Dietrich was John Rainbird. Rainbird's collections covered a wide range, from plants, reptiles, and fishes to Aboriginal artifacts.

The comradeship of the various members of the Bowen naturalist community was a tremendous advantage to Amalie Dietrich, and the collections she packed and dispatched followed one another in quick succession. A major fraction of her ethnological material came from this region and farther north. In addition to wooden swords, rain-forest shields, clubs, spears, and fishing gear, she also obtained the Aboriginal skeletons and skulls especially requested by the celebrated Berlin physiologist and anthropologist Rudolph Virchow.¹⁴ Her collections of Australian ethnographic material, over 130 items, were bought by the Leipzig Museum für Völkerkunde in 1881 following the demise of the Godeffroy Museum. These collections remain especially important because they were obtained in the early years of European contact with Aboriginal peoples.

Dietrich left Bowen in late 1872, her expected ten years in Australia having been reduced slightly because of changing circumstances in Europe; in addition to the negative effects of the Franco-Prussian War, the decline in German emigration to Queensland and the subsequent shrinkage of the

firm's trading routes had a serious impact on the Godeffroy company's finances. Sailing first to Sydney and then making a brief call in Samoa (or perhaps, since the records are confused, Tonga), she arrived back in Hamburg in 1873.

Both she and her daughter had changed greatly over the course of her almost ten-year absence. Amalie, with her weathered face and unconventional ways, had adopted some of the rough habits of the frontier settlers, her close companions over many years; Charitas, on the other hand, was by then a young lady of very conventional educational background, accustomed to the rigidly maintained behavior patterns of the middle-class families for whom she worked as a governess. Amalie's ideas and those of Charitas about what was interesting and important in life were very different. Shortly after her mother's return, Charitas married pastor Christian Bischoff and moved with him to the north Schleswig town of Roagger. To a large extent mother and daughter parted company, a situation that sorely distressed the warm and friendly Amalie.

For several years after her return she lived rent-free in a room at the Godeffroy building and continued to work on her collections, both in the Godeffroy Museum and the public Botanical Museum. She attended all the open lectures at the latter and those at the Hamburg Natural History Museum; at least for a time in the 1870s she was a dues-paying member of the Verein für Naturwissenschaftliche Unterhaltung zu Hamburg. Having accumulated a modest amount of capital from the salary she was paid while in Australia, she was able to make a few trips, visiting old friends in Rotterdam and attending an anthropological congress in Berlin. Very occasionally she visited the Bischoffs. In 1879 J. C. Godeffroy & Sohn went bankrupt, and within a year Amalie had to move to a municipal home for elderly women in a working-class suburb of Hamburg, where there is now a street named after her. She died on 9 March 1891, two months before her seventieth birthday, at her daughter's home in Rendsburg, the town to which the Bischoffs had moved in 1890. At least a partial reconciliation between mother and daughter seems to have taken place some years previously, perhaps after the birth in 1887 of Amalie's only grandson, Adolf.

Amalie Dietrich's main botanical collections are now housed in the Hamburg Botanical Museum; a number of other institutions, including the Victorian National Museum in Melbourne, hold the many duplicates sold to them by Godeffroy in the 1860s and 1870s. Several Australian plants and insects bear her name. Her ten years of "roughing it" in the Australian bush may well have been the best of her adult life. In this period she had what she valued highly: freedom to wander at will, freedom from the usual pressures hemming in most of us, and the great pleasure and satisfaction of exploring the unknown, of discovery. She remains a most interesting personality.

The form of Charitas Bischoff's best-selling biographical novel, based on her mother's life and work but much altered and romanticized, is perhaps explicable in part by Charitas's pressing need to earn money to pay for her son's university education and maintain a comfortable lifestyle after her husband's death in 1894.

Of Australia's early self-taught women botanical collectors, the only one found listed in the Royal Society's *Catalogue* was FLORA CAMPBELL,¹⁵ later MARTIN (d. 1923), from Brighton, near Melbourne; for many years she lived in South Yarra, now a Melbourne suburb. About 1890, or soon after, she married William Martin, and following his retirement because of ill health, they moved to a farm in the township of Drouin, Gippsland, in the southeastern foothills of the Australian Alps, southeast of Melbourne (figure 2.4). Settlement in this botanically interesting and very beautiful, densely forested region came only in the 1870s. A railway link with Melbourne opened in 1878, after which a considerable amount of logging began, taking its toll on the virgin forests.

A serious student of botany from at least the 1870s, Flora Campbell joined the Field Naturalists' Club of Victoria within a year or two of its start in 1880 and was prominent at its monthly meetings from 1884. She took part in the club's botanical excursions and regularly exhibited her collections and watercolor sketches at meetings. Victoria cryptogams, especially lichens and mosses, were her principal interest. Published in the club's journal in 1886 and 1888 (see bibliography), her lists contained a notable number of species previously unrecorded in the state. Campbell Martin's collections are considered to have constituted a significant contribution to Victoria's early natural history studies.

She had many overseas botanical correspondents. Her work was used by London mycologist M. C. Cooke in the preparation of his *Handbook of Australian Fungi* (1892), which listed known fungal

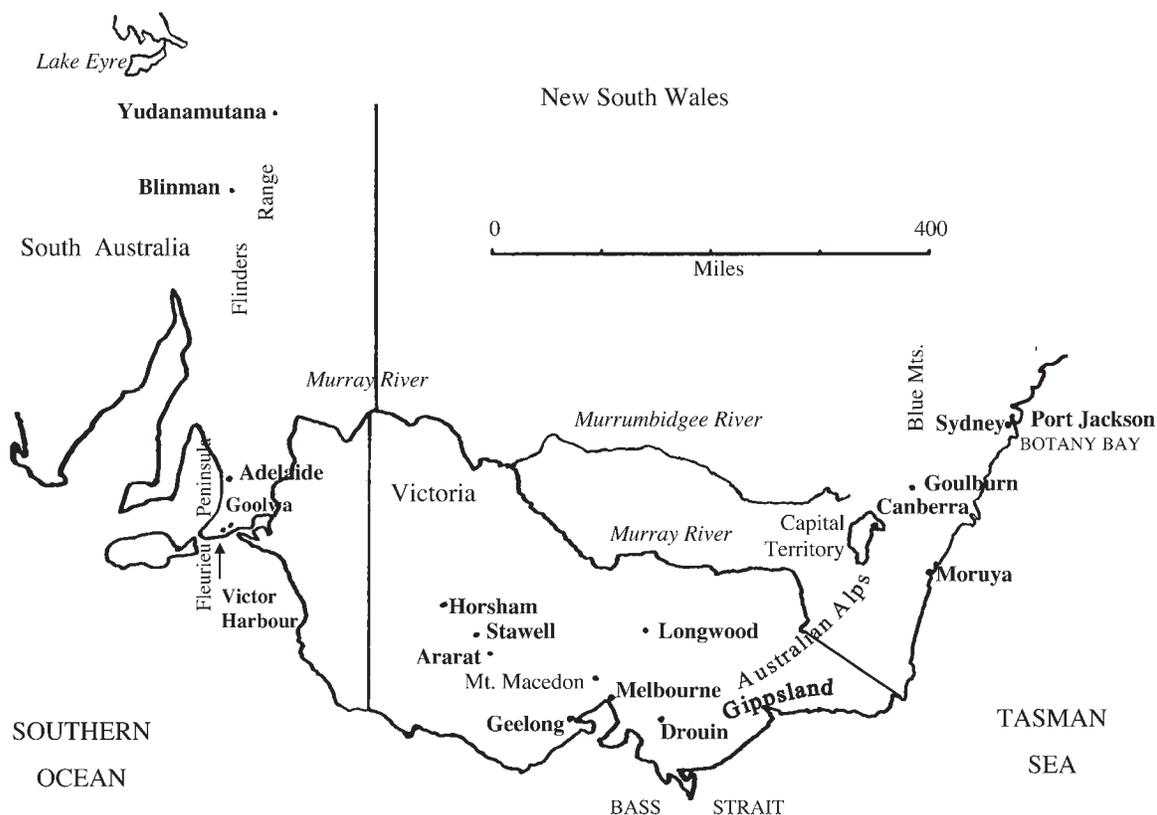


Figure 2.4. Southeastern Australia.

species for eastern continental Australia. In his preface Cooke thanked leading Australian botanists Ferdinand von Mueller and Frederick Manson Bailey, and with them Flora Martin, whom he singled out especially, for her cooperation and her “unflagging energy.”¹⁶ Among the many specimens accompanied by figures and notes that were sent to Cooke in London, Mrs. Martin’s sketches were some of the few that were usable. Frederick Manson Bailey, a fern specialist working in Queensland, also used her work in his publications.

Her interests were by no means restricted to lichens and mosses but included Victoria ferns and wildflowers, as well as fossil plants and wood from Gippsland. Plant diseases, particularly those resulting from attacks by parasitic fungi and insect pests, were the subject of her paper read before the Field Naturalists’ Club in 1887. In it she advocated the study of fungi to forward the work of determining control measures that would reduce the economic losses these plant parasites caused. In a somewhat longer paper, published in the club’s journal in 1896, she reported on her use of plant materials as sod conditioners and fertilizers on the part of her Drouin farm she had left in its natural state as a sanctuary for birds and plants. This 1896 paper reflected the change of direction of her interests about this time, her main focus switching from botany to general farming and horticultural matters.

Flora Campbell Martin donated her collections of named Victoria species to the Museum of Economic Botany in the Melbourne Botanic Gardens, already a well-established and respected scientific center. After her death at Drouin on 14 March 1923, a large number of her colored drawings and illustrated notes on fungi were saved from destruction by a fellow botanist and club member who recognized their possible value to other members and to the State Agricultural Department.

JESSIE LOUISA HUSSEY¹⁷ (1862–1899) was one of only three botanists who pioneered investigations in the southeastern region of South Australia in the 1880s and 1890s. Her only published report appeared as a brief abstract in the *Transactions* of the Royal Society of South Australia, and so it is not listed in the London Royal Society’s *Catalogue*.

The daughter of Charles Henry Hussey and his wife, Harriet Ada, née Webb, Jessie Louisa was born on 5 June 1862 in Goolwa, at the base of the Fleurieu peninsula, about fifty miles southeast of Adelaide, where the Murray River reaches the sea (figure 2.4). At the time of her birth, her father, who had earlier been a schoolteacher, had a general store. In 1880 the family moved to Port Elliot, some miles farther south, where Charles Hussey established another general store. Seven years later he became the region representative for the Encounter Bay district in the twelfth South Australian parliament.

Port Elliot, where Jessie Louisa Hussey spent most of her life, is now a popular tourist town, but in the 1850s it was the major seaport for the Murray River trade. A decade or so later, port operations were moved down the coast to Victor Harbor, since Port Elliot's shallow, exposed anchorage had led to the loss of several ships during gales. By Jessie Louisa's time, travel along the peninsula was relatively easy, with a railway line, South Australia's first, connecting Victor Harbor, Port Elliot, and Goolwa. Powered by draft horses, the railway's main purpose was to transship agricultural produce from the paddle steamers of the river to Victor Harbor, but passengers were also accommodated.

Her early interest in the seaweeds of the coastal waters around Port Elliot was stimulated and given a sharper focus in 1893 when a request was passed on to her from Victoria's government botanist Ferdinand von Mueller for someone to collect marine algae along the South Coast. Despite poor health, she carried out an impressive amount of investigation, amassing large collections over the course of a few years. A great many of her specimens were sent by von Mueller to Swedish phycologist J. G. Agardh of Lund, but other well-known algal taxonomists throughout Europe and in the United States received material from her as well. When her name as a collector became known, she acquired many botanical correspondents, including Dutch algologist Anna Weber-van Bosse of Amsterdam.¹⁸ For several years a member of the Field Naturalists' Section of the Royal Society of South Australia, she exhibited her seaweed collections at section gatherings from time to time. In 1898 she became an honorary member of the newly established Mueller Botanical Society of Western Australia.

Her interests were not restricted to marine plants, and during the late 1890s she collected extensively in the Goolwa–Port Elliot districts. The region behind Port Elliot was one of great beauty and considerable botanical interest. Then a vast area of untamed scrub and woodland, part still survives in its natural state as protected parks. Many of Jessie Louisa's specimens, including a number of first records for South Australia, were exhibited at the Field Naturalists' section meetings. Her "Catalogue of the native flora about Port Elliot," read before the Royal Society of South Australia in April 1897, listed 355 plants; 25 of these were additions to the region, and 3 were new records for South Australia. Of special interest were some of the orchid species she collected, among them a specimen of *Pterostylis acuminata* var. *ingens*, never since found in South Australia. It is thought to have come from the Hindmarsh Waterfalls region, part of a rugged, heavily wooded area to the north of Victor Harbor on the upper reaches of the Hindmarsh River.

In poor health from 1889 when she suffered a severe illness, she died in Port Elliot three months before her thirty-seventh birthday, on 16 March 1899, of ovarian cancer. Shortly after her death, nearly two thousand of her specimens were offered to the South Australian Museum in Adelaide; the Hussey material was donated on permanent loan to the State Herbarium of South Australia, Adelaide, about 1975. Additional collections of her plants are held in the National Herbarium, Melbourne. Jessie Louisa Hussey's work of collecting and enumerating the flora of her region, both land plants and marine algae, is considered especially important because, after her, little further botanical exploration was done there for thirty years. J. G. Agardh named two species of marine algae after her, the red alga *Chrysymenia husseyana* J. Agardh (now *Hymenocladia usnea*) and *Pachyglossum husseyanum* J. Agardh (1894). Agardh also named a new monotypic genus *Husseyia*, in her honor. *Pimelea husseyana* F. Muell., a species of the genus *Pimelea* (the flowering evergreen shrub commonly known as rice flower), also bears her name.

Botanical Artists

The vivid, vibrant colors and delicate forms of Australia's native flowers captivated and inspired the continent's early artists as well as the collectors. The best known and undoubtedly the most controver-

sial among the women botanical painters of the period who were born in Australia was MARIAN ELLIS ROWAN,¹⁹ née RYAN (1848–1922).

Rowan's work falls across the boundary between art and natural history illustration. Her studies of flowers, birds, and insects were generally set in context, but the surroundings were often painted in her own impressionist style, with dramatic use of color. Consequently, art historians place her in the category of talented illustrator, while naturalists point out that her work lacks the detail necessary in scientific illustration. Criticism aside, however, Rowan at her best produced powerful and arresting pictures that presented a view of Australia's strikingly beautiful flora to a wide public. She is generally considered to have painted more species of the flora of Australia and other countries than any other artist of her time.

The oldest of seven children of pioneering parents Charles Ryan and his wife, Marian, Ellis (as she was called) was born in Melbourne on 30 July 1848. On her father's side her family background was somewhat unusual; her Irish paternal grandmother, Ellis Agar Hartley, was the illegitimate child of King George IV and the Countess of Brandon. Her mother, Marian, was the daughter of very successful sheep farmer and naturalist John Cotton, who had emigrated with his family to Victoria in 1843; a lawyer educated at Oxford, he was a keen ornithologist with a number of important publications to his credit.²⁰ During her earliest years Ellis lived at Killeen Station at Longwood, near the Strathbogie Ranges where her father leased land, but the family moved to Melbourne when she was about five. Attendance at a school for young ladies gave her the education then considered suitable for girls of her social position, providing instruction in such subjects as French, lace-making, and watercolor painting. At age twenty-one she made her first trip to Europe, and based herself in England for a year. Already interested in flower painting, she may well have taken art lessons while in London. Two years later she demonstrated her developing talents, winning a bronze medal at the 1872 Intercolonial Exhibition in Melbourne for her screen of four panels of Australian wildflowers.

Her father's acquisition of twenty-six acres of hill station property on Mount Macedon (figure 2.4), about forty miles north of Melbourne, further strengthened her interest in botanical subjects. Although severely damaged by bush fires in 1983, the socially exclusive hilltop retreats on Mount Macedon, with their beautiful terraced gardens that blend into the natural bush setting, are still widely recognized as being of national historic importance. In the 1870s and 1880s a number of the colony's "gentlemen scientists" acquired land in the area, built summer residences, and established fine gardens. Derriweit Heights, the house that Charles Ryan built on Mount Macedon, was surrounded by impressively beautiful grounds that became well known among botanists and horticulturalists beyond Australia. An enthusiastic naturalist himself, Ryan engaged the well-known landscape architect and designer William Robert Guilfoyle, curator of Melbourne's famous Royal Botanic Gardens and owner of a neighboring property, to plan the garden layout; Victoria government botanist Ferdinand von Mueller advised on exotic plantings. Von Mueller also encouraged Ellis in her flower painting and invited her to contribute to his large collection of studies of Australian flowers, work she continued over many years.

In 1873 Ellis Ryan married Frederic Charles Rowan, a captain in the British Army who had been badly wounded in the New Zealand Wars (see New Zealand section). After Captain Rowan's return to New Zealand as sub-inspector for the Constabulary of Armed Forces, the family lived in the garrison settlement at Pukearuhe near New Plymouth, Taranaki, in the North Island. The Rowans' only child, Eric, known as Puck, was born in 1875. Encouraged by her husband, who also had botanical interests, Ellis took up painting local wildflowers, and the hobby became her greatest interest during her five years in New Zealand. When Frederic Rowan gave up his military career and the family returned to Melbourne, Ellis accompanied her husband, who had business interests, on his various trips, painting native wildflowers wherever she had the opportunity. On an 1880 trip to Western Australia she met English flower painter Marianne North, who emphasized to her the importance of being able to travel freely. North seems to have encouraged Ellis in oil painting and advised on various matters, including the placing of flowers in their natural habitats with bold background effects, such as sunsets or storm clouds. In 1883 Ellis and her sister Blanche Ryan visited India, and she painted in the Himalayan foothills. Four years later she made the first of six visits to tropical Queensland, where she found herself captivated by the wonderful variety of plant and insect life, especially the vivid colors of the wildflowers.

By the 1880s she was winning prizes at art exhibitions, the first notable one a gold medal at the Melbourne International Exhibition in 1880 for a screen on satin. She and flower painter Catherine Purves were the only Victoria artists to win gold, but an official protest from Melbourne's male professionals resulted in the belated award of a silver medal to the much-respected Australian landscape painter Louis Buvelot. At the 1888 Melbourne Centennial International Exhibition, Ellis Rowan again won the highest awards, taking both gold and silver medals for her flower paintings. Again the Victorian Artists' Society lodged a protest—but the jury held to its original decision. Many of the country's well-known male painters were of the opinion that Ellis Rowan's work did not qualify as pure art; bitterness at what was considered her unjustified success was permanent among her male rivals.

A few years after the death of her husband in 1892, Rowan set off on extended travels. During a two-year stay in London in 1895 and 1896 she staged her first one-woman exhibition outside Australia. Her work aroused considerable interest and resulted in several commissions. Queen Victoria accepted three of her paintings. In New York she met botanist Alice Lounsberry, with whom she spent four years traveling through the United States and the West Indies. Together they produced three books, *A Guide to the Wild Flowers*, *A Guide to the Trees*, and *Southern Wild Flowers and Trees*, which became texts for botany students and went through several editions.²¹ Rowan also held several exhibitions, including one in Chicago and one in New York.

About 1905 Western Australia's delicate desert flowers drew her for a second visit, but her most ambitious undertakings after the turn of the century were her two trips to New Guinea in 1915 and 1917. The eastern half of the island (figure 2.1), then an Australian protectorate, had much that was unknown and unrecorded botanically, including some spectacularly large and remarkable flowers. By then she was nearing seventy; her health inevitably suffered in the tropical heat, and she contracted malaria. Further, despite the presence of a number of German-owned coconut palm plantations and several mission stations, basic safety was far from sure. Nevertheless, with her bold and vibrant colors and her confident brush strokes, she did full justice to New Guinea's strange and wonderful flora. On her second visit she painted the island's birds of paradise, brilliant creatures with their masses of light, delicate plumes. A 1918 exhibition of these New Guinea paintings included 172 depicting flowers, 40 showing birds of paradise, and 72 recording fungi; of the fungi 71 were of previously unknown species. During the last years of her life she painted New Guinea butterflies and moths from the Dodd collection.²²

In addition to her joint publications with Alice Lounsberry, she brought out *A Flower Hunter in Queensland and New Zealand*²³ and also contributed a great many illustrations of scenery and plants for popular publications such as *New Idea* and for *Picturesque Atlas of Australasia*. The *Atlas* was an ambitious, profusely illustrated, three-volume work to which late nineteenth-century Australia's cultural, educational, and political leaders contributed. Its publication is seen as an important cultural milestone for Australian society.²⁴ Her paintings of wildflowers were used commercially by the Royal Worcester Porcelain Company in a commissioned series of hand-painted ceramics produced about the time of the First World War.

Two years before her death at Macedon on 4 October 1922, she held the largest solo exhibition in Australia up to that time, showing one thousand paintings, all for sale except her butterflies; proceeds were over two thousand pounds. She wanted her works to be made accessible to the Australian public, and eventually, a year after her death and after considerable controversy in the Australian House of Representatives, the commonwealth government bought 947 paintings of flowers and birds of Australia and New Guinea for five thousand pounds. These are now part of the Pictures Collection of the National Library. In all, Rowan produced over three thousand paintings; she regularly kept the originals and sold copies.

Small and delicate, but endowed with great physical stamina and single-minded determination, Ellis Rowan dedicated her life to success as an artist. This required a sizable amount of family money, as well as influential connections and a capacity for unabashed self-publicity. Her son was brought up mainly by Ryan relatives and may well have suffered from lack of parental attention and direction; he died in a Rhodesian jail at age twenty-two. Rowan's artistic achievement was considerable; her international reputation as an original and talented flower painter, an occupation then widely considered little more than a female hobby, demonstrated very clearly the artistic as well as the scientific value of such

work. In 1966 the first building established in the National Botanic Gardens was named in her honor, the Ellis Rowan Building.

ROSA CATHERINE FIVEASH²⁵ (1854–1938), a contemporary of Ellis Rowan, was a botanical artist of a different style, her work being valued especially for its scientific accuracy and its delicacy. A quiet, modest, and somewhat retiring person, she never had Rowan's national standing and after her death dropped into obscurity, until the publication of a book of her paintings in 1974 reawakened interest in her story.

The youngest child of Robert Archibald Fiveash and his wife, Margaret, née Rees, she was born in Adelaide, South Australia, on 22 July 1854. Robert Fiveash had arrived in South Australia from England as an assisted immigrant in 1839 and, starting with a butcher's shop in Adelaide, gradually acquired more and more business interests, especially in mining concerns recently established in the Flinders Ranges north of the city.²⁶ In 1867 he was appointed South Australian superintendent for the London-based Yudanamutana Company's copper mines at Yudanamutana and Blinman (figure 2.4). Within a short time he himself owned a mine and served on the board of directors of another mining and smelting business.

Rosa was educated at home by a governess, but in 1881, at the age of twenty-seven, she enrolled at the Adelaide School of Art and Design, where she studied for seven years. After receiving an art class teachers' certificate from both Adelaide and South Kensington (London) art schools, she taught art privately and at Tormore House School, a private but academically progressive school for girls in North Adelaide.

The illustration of native plants may not have been part of her earliest formal training, but she quickly made it her specialty. She was very interested in botany and actively involved in the Field Naturalists' Section of the South Australian branch of the Royal Society from its founding in the early 1880s. In 1882 she was chosen from among the Adelaide art school's students by John Ednie Brown, South Australia's state conservator of forests, to illustrate his *Forest Flora of South Australia*.²⁷ Although this project remained incomplete, the nine parts published between 1882 and 1890 contained thirty-two colored lithographs of native plants by Rosa Fiveash.

Known as a versatile and meticulous illustrator of scientific papers, she prepared seven colored plates for the 1891 report by Sir Edward Charles Stirling on the marsupial mole; these included several osteological studies, carefully and accurately drawn to scale. In his acknowledgment of Rosa Fiveash's contribution, Stirling pointed out that "in many instances [her illustrations] supply useful information as to size and form, and render more intelligible my own imperfect descriptions." Perhaps the most interesting from the nonspecialist's point of view was Rosa's painting of the complete animal. A small creature, about five inches in length, it has long, silky, light-brown fur with darker markings at the hind-quarters, "so bright and beautifully variable in tint, according to the incidence of light, as to invite the use of the term iridescent."²⁸ The announcement of the discovery of this mole caused a considerable stir in the scientific world, in part because the animal bore a strong resemblance to the South African mole, a placental mammal. In his preliminary reports, Stirling had placed it in the Monotremata,²⁹ the order of egg-laying mammals that includes the duck-billed platypus; the poor state of preservation of the first specimen he examined (sent to the South Australian Museum from a cattle station in the Northern Territory) made it difficult to find critical features, but within a few years it was recognized as belonging to the Marsupialia. Rosa Fiveash also painted many watercolor illustrations for a later article by Stirling and zoologist-museum curator Edgar Ravenswood Waite; this work concerned toads, small Aboriginal sculptures from the Lake Eyre region.

Over a period of thirty years she collaborated with physician and orchidologist Richard Sanders Rogers (1861–1942), illustrating his many publications on orchids; these included the orchid section by Rogers in John McConnell Black's *Flora of South Australia*, and his *Introduction to the Study of South Australian Orchids*, a 1911 collection of previously published articles prepared for young people.³⁰ J. B. Cleland's *Toadstools and Mushrooms* was also enriched by her contributions.³¹

Another of her interests was china painting, and she is credited with having introduced the art to Adelaide. She carried out all stages of the process herself, doing the firing in an assayer's muffle furnace, perhaps one inherited from her father.

She was remembered as a somewhat austere but kindly woman, quiet and hardworking. She continued to paint until her eyesight failed when she was about eighty. Apart from two years when she spent some time in Britain, she lived all her life with her unmarried sister Emily in the Fiveash family home, Gable House, in North Adelaide; her studio there looked out on a garden filled with Australian wildflowers. Both sisters were devout Anglicans. Rosa died on 13 February 1938 in Adelaide, in her eighty-fourth year.

Described by Richard Rogers as Australia's foremost botanical artist of her time, Fiveash could capture the beauty and delicacy of a flower without sacrificing any scientific accuracy. In 1937 she presented 130 of her paintings (four bound volumes of strong and vibrant watercolors) to the Public Library of South Australia; they are now housed in the State Library and the South Australian Museum. A collection of forty-eight of her watercolors was bought in 1900 by Robert Barr Smith and Lord Tennyson for the Adelaide Art Gallery as a gift to the colony;³² they were later transferred to Adelaide Botanic Gardens. In 1974, thirty-six years after her death, a collection of 139 of Fiveash's orchid paintings, along with text commentary by Noel Lothian, was published in both London and Adelaide.³³ Consisting of reproductions of a selection of her paintings held in the South Australian Museum, the book did much to revive interest in her work, even though it may not recreate the vibrant, glowing colors and perfect detail of her originals.

Less widely known than Rowan and Fiveash and half a century earlier was MARY MORTON ALLPORT,³⁴ née CHAPMAN (1806–1895), a competent artist who was one of Australia's pioneer lady painters of the settler generation, the forerunners of the professional flower painters who emerged in the 1880s. The daughter of Birmingham, Warwickshire, hotel owner William Chapman and his wife, Ann Floyd, née Evet, she was born in Birmingham on 17 May 1806. She attended a school run by Mrs. William (Hannah) Allport at Cedar Court, Aldridge, Staffordshire, about ten miles north of Birmingham. Instruction there included a notable concentration on art, a subject taught in a style strongly influenced by that of the school's former drawing master John Glover (1767–1849), a skilled and popular landscape artist. Mary was taught by Mrs. Allport's two older children, who had absorbed Glover's style and technique, and she herself appears to have stayed on as a student teacher after completing her own schooling. She married the Allports' youngest son, Joseph (1800–1877), a solicitor, in December 1826 and for several years lived in West Bromwich, now a northwestern suburb of Birmingham.

Having decided to take up farming in Australia, Joseph and Mary Allport, with four partners, either relatives or long-standing friends, sailed on the *Platina* for Van Diemen's Land (later Tasmania) in July 1831. They arrived at Hobart Town in December and settled on their grant of land at Black Brush in the Broadmarsh district, about twenty miles outside Hobart Town (figure 2.5). Life was difficult, and less than a year later, when they realized that their land could not support them all, they dissolved the partnership. Joseph resumed his former career, and with some help from George Meredith, father-in-law of Louisa Meredith (see below), he was able to form a partnership with Hobart Town solicitor George Cartwright. The firm of Cartwright and Allport prospered, Joseph Allport becoming one of the most successful barristers of his day and a recognized authority on real estate law.

Almost as soon as she arrived in Tasmania, Mary returned to her art, recording the surroundings of her rough, primitive bush hut in delicate line drawings. As early as July 1832 she placed an announcement in the weekly *Hobart Town Courier* advertising portrait miniatures on commission. She was probably the first woman in Australia to attempt such a business enterprise, and she became well known in the community for the work. Her watercolor portraits on ivory sold for ten guineas for an original miniature and five guineas for a copy; many others were painted for family and friends.³⁵ When the family moved in 1832 to Hobart Town, where at first they had furnished rooms and then a cottage, she began her Tasmanian wildflower painting and also started to experiment with prints. Her hand-colored engraving on copper of local flowers was used as a frontispiece for the *Hobart Town Almanack and Van Diemen's Land Annual*, an independent periodical published at the time by government printer William Gore Elliston.

In 1839, eight years after their arrival in Tasmania, the Allports moved to Aldridge Lodge, Hobart, their family home from then on. Although he had given up farming, Joseph Allport's interest in horticulture remained strong. The extensive gardens and grounds of Aldridge Lodge were beautifully landscaped and included fish ponds and a fine orchard; a long, impressive driveway led to the house.

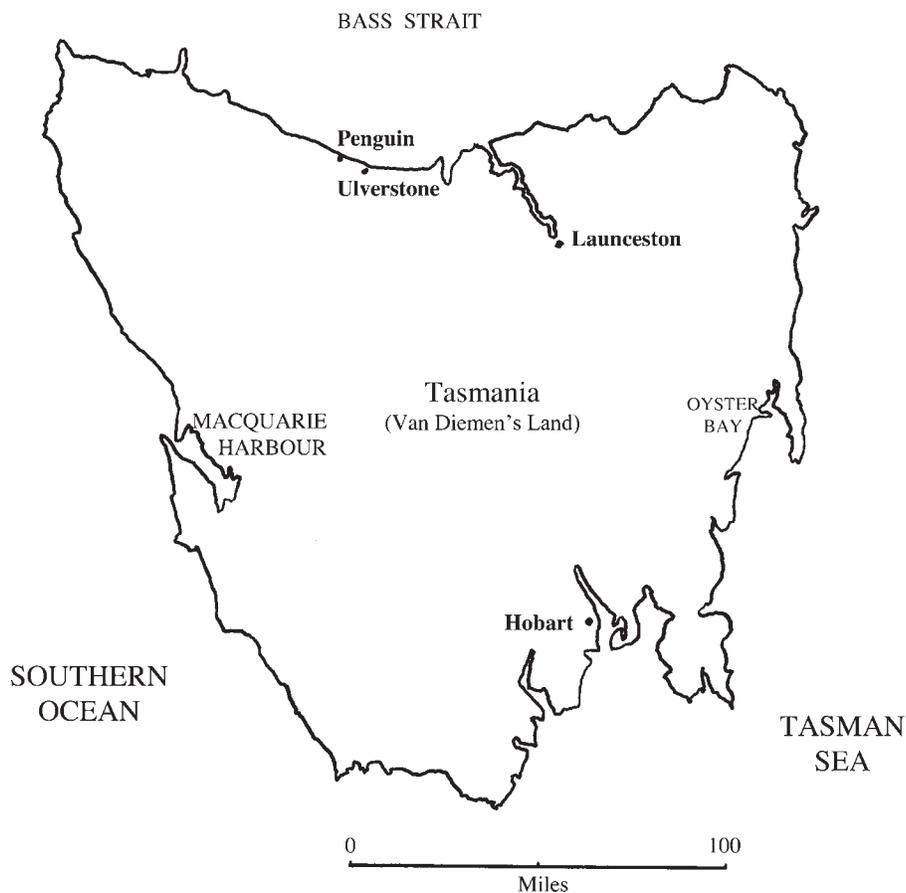


Figure 2.5 Tasmania.

Both Allports were interested in many aspects of natural history and promoted the development of the town's botanical gardens. Both were also active in the Tasmanian Society; Mary became a corresponding member in 1841 and then a resident member. Her lithograph the *Comet of March 1843 seen from Aldridge Lodge, Van Diemen's Land* was published in the society's journal, the *Tasmanian Journal of Natural Science, Agriculture, Statistics, &c.*,³⁶ Australia's first all-science periodical, which soon earned an international reputation for its high standards.³⁷ Another of the early lithographs she began producing about the time she moved to Aldridge Lodge appeared in the first issue of the Tasmanian Society's journal (1841). By the early 1840s she was painting landscapes and natural history studies, such as her *Australian Admiral Butterfly* and her *Opossum Mouse from Grass Tree Hill*, drawn on stone and lithographed, possibly with the help of the experienced London engraver and lithographer Thomas Bluett, who had arrived in Hobart Town in 1843. She exhibited at the Hobart Town Art Treasures Exhibition in 1845 and at later exhibitions, including the Universal Exhibition in Paris in 1855, where she showed a chess table with wildflowers painted in the squares of the board, the only piece of craft work she is thought to have done.

Although much of her time was taken up by her children and her household chores, Mary always managed to fit painting into her ordinary day-to-day life. She encouraged her children to paint and gave them and children of her friends instruction and help; her son Morton Allport (1830–1878), a naturalist, became well known as a landscape photographer. With these many responsibilities and activities, as well as her hobbies of music and archery,³⁸ she had a full life, and commissioned portrait orders sometimes took a long time to complete.

Mary Allport painted in part to have a record of the places, scenery, and transitory events surrounding her early years as a settler, a record that at the same time made clear that even in a rough penal colony a "civilized" life with European cultural values was possible. Nevertheless, she quickly came to feel that she was above all a Tasmanian, rather than a displaced English gentlewoman. Both her

journals and her paintings emphasize her ready acceptance of life in Tasmania and her appreciation of the native flora for its beauty rather than its exotic qualities;³⁹ when she painted the Australian blue gum tree, a species she greatly admired, she gave full justice to its grace and color in its native setting, rather than attempting to make her picture conform to European experience and expectations. Her painting continued until at least 1873 and most likely stopped only when her eyesight began to fail. She died at Aldridge Lodge on 10 June 1895, a month after her eighty-ninth birthday, following a short illness; she had outlived her husband by eighteen years. Of her large family, two of her children survived her. Collections of Allport works are held at the Allport Library and Museum of Fine Arts (State Library of Tasmania, Hobart), the Mitchell Library (State Library of New South Wales, Sydney), and the City of Ballarat Fine Art Gallery (Ballarat, Victoria). Her etchings, engravings, and lithographs are considered to be the first made by a woman in Australia. She clearly holds an honorable place among those who recorded early settler life and the natural environment in Tasmania, and perhaps may also be seen as having a not insignificant role in the colony's cultural development.

Nine years after Mary Allport's arrival in Tasmania, another pioneer woman botanical artist and nature writer, credited with being one of Australia's first conservationists, joined the island's settler community.

LOUISA ANNE MEREDITH,⁴⁰ née TWAMLEY (1812–1895), the daughter of miller and corn inspector Thomas Twamley and his wife, Louisa Anne, née Meredith, was born at Hampstead, near Birmingham, on 20 July 1812. Educated at home by her mother, she developed an interest in painting and writing; by her early twenties she was much involved in Birmingham literary and artistic circles, as well as in organizations advocating social reform. Among the latter was the Chartist movement, originally the Birmingham Political Union, whose aims included securing the vote for men of the working class and the abolition of the property qualification for becoming a member of parliament. She remained interested in the movement for many years and, independent and outspoken in her opinions, is thought to have written for its press. During these years she also became interested in the natural world of plants and animals, an interest that later grew into efforts to help introduce the first wildlife conservation measures passed into law in Tasmania.

In 1835 she published her first major work, *Poems*, illustrated with her drawings and etchings of flowers and well-known beauty spots such as Kenilworth Castle and Tintern Abbey. The book brought her to the attention of London's literary world; poet and essayist Leigh Hunt was one of those who noted her *début*. The following year saw the publication of a second book, *The Romance of Nature*, a volume of verse and prose with hand-colored illustrations from her drawings that retold the ancient legends associated with flowers; she dedicated it to William Wordsworth. Two more works of the same general pattern of poems and illustrations appeared in 1837 and 1839, *Flora's Gems*, with drawings by James Andrews, known as an illustrator of somewhat sentimental flower books, and *Our Wild Flowers*, a book for children that used her own hand-colored drawings. Also in 1839 she contributed the article "Autumn ramble on the Wye" to the *Annual of British Landscape Scenery*.⁴¹ Thus, by the time she left England in August 1839, Louisa Twamley was already a very competent flower painter and a fairly successful author, producing the collections of stylized flower paintings accompanied by "delightfully awful"⁴² verse that were very much in vogue in early nineteenth-century England; this "cult of the language of flowers" was providing a ready market for work by many women flower painters and verse writers.⁴³

In April 1839 Louisa married her cousin Charles Meredith (1811–1880), who, although born in Pembrokeshire, Wales, had lived in Australia for most of his life; his father had moved to Van Diemen's Land when Charles was about ten, and he grew up on the Meredith estates of Belmont and Cambria, at Oyster Bay on the Tasmanian east coast (figure 2.5). Setting out on his own in 1834, he went to New South Wales, where he invested in sheep in the Murrumbidgee region and in land for cattle raising in the Maneroo district, both recently explored areas in the inland high plains of southern New South Wales. His 1839 marriage in Birmingham to Louisa Twamley took place during a brief visit back to Britain.

The Merediths sailed for Australia on the bark *Letitia* a few months after their marriage and arrived in Sydney in September 1839. After a trip of about a hundred miles inland to Bathurst, from where Charles inspected his land and stock holdings, they returned to Sydney, settling into a somewhat dilapidated house in the suburb of Homebush. Little more than a year later, Charles's investments having become a financial disaster, he and Louisa and their infant son were obliged to return to the Meredith family estates in Van Diemen's Land. They arrived in Hobart Town in October 1840; the move appears

to have been a relief to Louisa in some ways, the fresh greenness of the Tasmanian landscape with its more English appearance being much more to her liking than the heat and dust of New South Wales.

For the next fifteen years Charles Meredith tried to make a living as a farmer but with no success; his debts kept accumulating. In 1855, in part due to strong encouragement from his wife, he stood for parliament and began a political career that lasted for twenty-four years. His ministerial appointments included periods as colonial treasurer and minister for lands and works, but his greatest legacy for future generations was the introduction of legislation for the protection of Tasmanian wildlife, a cause that Louisa Meredith had been championing from her arrival in Australia. The indiscriminate slaughter of the beautiful black swan particularly aroused her wrath, and with her behind him, Charles Meredith, who from boyhood was well acquainted with the animals of the Tasmanian bush, introduced a bill for its protection. So irrelevant were ideas of conservation to most of Australian society at the time that he had to persist for session after session until the act was finally passed. Similar measures were put through to protect marsupials from wholesale destruction. Louisa also initiated action with Mary Selina Gellibrand, a member of Tasmania's politically prominent Gellibrand family, to found the first Tasmanian branch of the Society for the Prevention of Cruelty to Animals.

Between 1840 and 1847 she had four sons, the second dying in infancy. During this period she also resumed the nature-writing career she had embarked on before leaving England. Her 1844 *Notes and Sketches of New South Wales* described life in the colony, some of it at second hand from accounts given her by her husband, but she also wrote about the birds, flowers, and insects she observed, especially those around her house at Homebush.⁴⁴ She used this work as a public forum to set out her views on environmental issues, particularly her concerns about the destructive changes she saw the settlers were bringing to the fragile Australian environment and wildlife. Such views provoked some angry reactions in the Sydney press, but in London the work was well received following its publication by John Murray in his Home and Colonial Library editions, the first series of a number of lower-priced colonial editions that were brought out by various British publishers over the next 130 years.

Three similar books followed, works presenting detailed and sensitive accounts of the flora and fauna of Tasmania, including marine species, and illustrated with many of her own watercolor drawings; pungent social observations were frequently added as well. Her skill as a nature artist is underlined by the fact that her landscapes and flower paintings earned her medals in exhibitions in Australia and overseas, notably at the Melbourne Exhibition of 1866; a hand-colored engraving after one of her early paintings was included in Blunt's authoritative *Art of Botanical Illustration*.⁴⁵

In many ways the most valuable of Meredith's books was *My Home in Tasmania* (1852), specially prized as the first detailed and fairly realistic account of life in the colony by a woman settler.⁴⁶ The work, to a significant extent oriented toward an English market, was illustrated with landscape sketches by the author, as well as some by her friend Bishop Nixon.⁴⁷ An engraving of Nixon's sketch of Lath Hall served as frontispiece for the second volume; the Meredith's home for a time, Lath Hall was at the small community of Port Sorell, twenty miles east of Ulverstone on Tasmania's north coast. From the botanical point of view, Meredith's most important book was probably *Some of My Bush Friends in Tasmania* (1860); this work, which included eleven full-page, chromolithographed illustrations from her drawings of flowers and plants, gave simple descriptions of characteristic native flowers accompanied by botanical names and natural orders, as well as common names. Each section was introduced by one of her conventional poetic gushings about nature that anthropomorphized Australian flora and fauna in the fashion of the time, and again it was aimed at the English middle-class market; nevertheless the descriptions were acknowledged as being botanically accurate, and the work was considered an attractive, well-produced, although expensive, publication. It was the first of two *Bush Friends in Tasmania* books;⁴⁸ for the publication of the second, in 1891, four years before her death, she went back to Britain for the only time during her fifty-six years in Australia. Louisa Meredith's 1861 book, *Over the Straits*, was a lively description of an adventurous holiday trip across the Bass Strait to visit Melbourne and see life in the goldfields of Victoria; illustrated with her own sketches, it included notes on bird, animal, and insect life. Her *Travels and Stories in our Gold Colonies* followed in 1865.⁴⁹ Two more of her books recording the flora and fauna of Tasmania, with descriptions and comments on settler life in the colony, were brought out by London publishers in 1879 and 1880, *Our Island Home: A Tasmanian Sketchbook*, and *Tasmanian Friends and Foes*.⁵⁰ The latter had eight full-page color plates from her drawings, as well as numerous text pictures; included also, with permission, were copies of pictures by "Mr. Gould."⁵¹

Among her other publications were the two novels *Phoebe's Mother* (1870) and *Nellie; Or, Seeking Goodly Pearls* (1882, 2008), and a children's book, *Grandmamma's Verse-book for Young Australia* (1878).⁵² She also wrote many unsigned articles to the Tasmanian press, the kind of work she had done as a young woman in Birmingham. Not without interest in the present context is the memorial she prepared for the Hobart naturalist and landscape photographer Morton Allport, the son of Mary Allport whose work is sketched above.⁵³ Very much engaged in Hobart social life, Louisa Meredith enjoyed acting and took part in theatrical presentations at Government House.

Class conscious and vehemently prejudiced against the Aborigines,⁵⁴ she always regretted her colonial exile and, unlike her friend and fellow nature painter Mary Allport, took a long time to come to a fairly full appreciation of the beauties of Tasmania. Nevertheless, thanks to her literary and artistic abilities, she too made a notable contribution to the record of the island's natural history and its early colonial life. During her years in and near Hobart she kept in close touch with the naturalist community, and she was made an honorary member of the Royal Society of Tasmania. In 1884, four years after her husband's death and after much petitioning on her part, she was granted a Tasmanian government pension of one hundred pounds per annum for "distinguished literary and artistic services to the colony." She died in the Fitzroy district of Melbourne, at the home of friends, on 21 October 1895 at the age of eighty-three; burial was in Swansea, Tasmania. Two of her sons survived her.

Three Naturalists, a Science Promoter, and a Would-Be Geologist

The earliest work by an amateur Australian woman naturalist found listed in the Royal Society's *Catalogue* was the 1861 article by Mrs. LEWIS HUTTON (see bibliography), but little information about Mrs. Hutton has been uncovered. Clearly a woman of means, with education and connections to the London scientific community, she lived in Sydney in the 1850s. Her extended observations on Australian "soldier ants," in particular their procedures and rituals for the burial of dead members of their colony, were reported by letter to the London Linnean Society and published in the society's journal.

AGNES FLEMING, née AGNEW, later KENYON,⁵⁵ whose interests were in conchology, was the Scottish wife of Alfred Henderson Kenyon, a storekeeper from Manchester, England. From at least the 1860s the Kenyons lived in Victoria, moving frequently as Alfred Kenyon followed his business interests from community to community north and west of Melbourne. A number of these communities, such as Ararat, Stawell, and Horsham, lying along one of the state's major east-west routes, were originally gold towns (figure 2.4); by the 1860s they were stabilizing as small agricultural centers. By 1875 Alfred Kenyon's health difficulties had led him to try farming, but a few years later, discouraged by several severe droughts between 1878 and 1881, the family settled in Melbourne.

Agnes Kenyon published eight conchological notes between 1896 and 1901, a time when her third son, Alfred, a graduate of the University of Melbourne, was also active in natural history studies.⁵⁶ For the most part she described species from Victoria and Tasmania, but she also wrote on new finds in Western Australia. Her first papers appeared in Australian journals; later she brought out a number of reports in the *Proceedings* of the London Malacological Society (see bibliography).

A second conchologist from this period was Tasmania's MARY LODDER (1853?–1911).⁵⁷ Her extensive list of shells in the Tasmanian Museum collection appeared in the 1898–1899 *Proceedings* of the Royal Society of Tasmania (see bibliography). Born in England about 1853, Mary Lodder was the eldest of the three children of Major General William Wynne Lodder and his wife, Elizabeth Frances. Mary moved to Australia at age twenty-two, arriving in Melbourne with others of her family on the *Carlisle Castle* in January 1875. Major General Lodder, of the Fifty-ninth Infantry Regiment, had served in India, and when he retired he joined what is known as the Castra Scheme. An arrangement of the 1800s, this scheme encouraged settlement in northern Tasmania where land was set aside for Indian Army officers who might retire to the colony and take up farming.⁵⁸ About 1875, when family members from England joined him, Major General Lodder built the fine, gabled, two-story house of Lohna on the north coast between Penguin and Ulverstone (figure 2.5). One of many large and impressive timber houses built in the area in the late nineteenth and early twentieth centuries, Lohna still stands and is one of the local visitor attractions.⁵⁹

Mary Lodder was active for many years in several branches of natural history but made a special study of the marine mollusca of Tasmania, whose waters were and still are especially rich in mollusca, as well as fishes and crustaceans. She rearranged the collections in the Tasmanian Natural History Museum in Hobart and filled in many gaps from her own extensive collections; by making comparisons with specimens in collections in Sydney and elsewhere, she was able to amend the list of names, identify several unknowns, and correct many mistakes. Her 1898 eighteen-page paper reporting her reclassification of Tasmanian marine mollusca was widely considered an important contribution to Tasmanian natural history studies.

Although reticent and retiring about her scientific work among her friends around Lohna and in Launceston, where she lived after the death of her mother in 1907, she belonged to several scientific societies and corresponded with shell collectors in Australia and abroad. A tireless worker in the Launceston Museum, she provided much assistance in the institution's educational programs. She was also very active in church and philanthropic circles, especially groups assisting girls and young children. After a period of failing health, Mary Lodder died in Launceston on 5 March 1911, when she was about fifty-eight; burial was in Ulverstone.⁶⁰

Also influential in early natural history studies in Tasmania was LADY JANE FRANKLIN,⁶¹ née GRIFFIN (1791–1875), although her contributions were in the form of promoting and encouraging science, rather than in carrying out studies herself.

Lady Jane's efforts were intertwined closely with those of her husband, Sir John Franklin (1786–1847). A nephew of explorer Matthew Flinders, Sir John had been a midshipman on Flinders's ship *Investigator* when Flinders first circumnavigated Australia in 1801–1804. Franklin is remembered especially for his work in polar exploration, particularly the investigation of a Northwest Passage during his tragic expedition of 1845–1847, but from 1837 to 1843 he was lieutenant governor of the colony of Van Diemen's Land. During his six years there, although seriously hampered by persistent political contention, he succeeded in carrying out a notable amount of work promoting educational and scientific development.

In the 1830s, despite its short period of settlement, the Van Diemen's Land colony had leaders who had developed science-oriented organizations. These groups were remarkably successful and in attainments and standing rivaled or surpassed the corresponding organizations in New South Wales, where political maneuvering and the elitist outlook of the gentleman-amateur tradition were a formidable handicap.⁶² Franklin is credited with establishing a government educational system and providing the leadership for the founding of the Natural History Society of Van Diemen's Land, also known as the Tasmanian Society, which had roots in the earlier, short-lived, Van Diemen's Land Scientific Society organized in 1829.⁶³ Franklin also provided financial support for the *Tasmanian Journal of Natural Science, Agriculture, Statistics, &c.*, whose emblem, the platypus, was chosen by his wife.

The work of organizing the Van Diemen's Land Natural History Society was an undertaking in which Jane Franklin was much involved. Although she consistently attempted to disguise her efforts as mere assistance for her husband, she nevertheless drew considerable criticism from the more conservative faction in the Hobart community, who objected to female interference in what they saw as men's affairs. Founding the group was an important step for science in the colony. Acceptance as a member depended on scientific merit, rather than political or social influence; standards were high, and the membership was not only intercolonial but international. During the 1840s the society's journal, Australia's first all-science periodical, became the main forum for the publication of antipodean science. Following Franklin's recall in 1843, the society was kept going by botanist Ronald Campbell Gunn until it merged with another group to form the all-island Royal Tasmanian Society in about 1848.⁶⁴

It has been said that during the six years Jane Franklin presided over Government House, "it became the hub and mecca for a long line of distinguished scientific visitors."⁶⁵ Under her direction, botanist Ronald Gunn (a student of William Jackson Hooker and the most outstanding botanist resident in the colonies) established a private botanic gardens, Alcanthe, at Lenah Valley, near Hobart, where the emphasis was on plants native to Tasmania. The gardens included a museum of natural history built in the form of a classic Greek temple, "the most pure example of the Greek Revival from the colonial period in Australia";⁶⁶ it is considered to have been the country's first natural history museum.⁶⁷ The present Lenah Valley Museums Galleries include a Lady Franklin Gallery.

Jane Franklin was a forceful woman who had succeeded, despite the prevailing prejudices, in acquiring an education that was advanced for a woman of her time. Born in London on 4 December 1791, she was the second of three daughters of John Griffin, a well-to-do silk weaver of Spitalfields, and his wife, Mary, née Guillemard. Jane had the good fortune to grow up in a family that gave her considerable freedom to follow her intellectual interests. Her formal education was limited to seven years at a boarding school for young ladies in Chelsea, where she received a good grounding in French, a basic acquaintance with arithmetic, and instruction in the elements of writing; later she worked, mainly on her own but with her father's encouragement, to "improve" herself and acquire an understanding of the world around her. Reading and extensive travel in Britain and on the Continent (usually with her family) were a major part of her self-constructed educational program; a brief period of tuition from an uncle in algebra and chess was also important to her. Overall, however, her education lacked the focus and concentration that systematic guidance might have provided. Her marriage to Captain John Franklin in 1828 gave her wider opportunities for travel, especially in the Mediterranean region when Franklin held a post at a naval station there, and her love of exploring in no way abated after she moved to Van Diemen's Land in 1837. Usually she went on her trips without Sir John but was accompanied by two or three servants, who provided adequate protection. She regularly kept a detailed record of her experiences and observations on these journeys that took her through parts of New South Wales, South Australia, and New Zealand; her 1841–1842 crossing of about one hundred miles from Hobart to Macquarie Harbour on Van Diemen's Land's rugged and isolated west coast was especially notable (figure 2.5).

Lady Franklin's writings include descriptions of landscapes and agricultural practices, but most of all she was interested in the early settler communities she passed through; her diary accounts are now considered valuable sources in the study of colonial life.⁶⁸ Although she built up a fossil collection, there is little in readily available sources to suggest that she made any significant direct contribution to natural history studies of the regions she visited. She may be seen as a patron of science in the early history of Van Diemen's Land, rather than a practitioner. As Penny Russell pointed out in her 1999 essay *Displaced Loyalties*,⁶⁹ this settler community, although it had shaken off most of the class barriers of the mother countries, was not yet able to permit any latitude to women. Interference in the public domain by the energetic, able, and strong-willed Jane Franklin inevitably stirred up resentment, no doubt even more so because as the governor's wife she was in the spotlight. Even in Britain and continental Europe, only a handful of women born before 1800 (such as Mary Somerville in Britain, Sophie Germain in France, and Elisabetta Fiorini-Mazzanti in Italy) succeeded in finding ways to enter into the intellectual work of the time and have their contributions readily accepted by male colleagues. Lady Jane Franklin died in London on 18 July 1875, in her eighty-fourth year.

With the initial interest of most of the London scientific establishment, including that of influential botanist Sir Joseph Banks, strongly focused on Australia's exotic plant and animal species, geological investigations in the colonies were relatively slow to start. Not until the mid-nineteenth-century gold discoveries in New South Wales and Victoria was there a strong incentive for further exploration of the country's rocks and minerals. The new wealth from the goldfields not only permitted funding of universities in Sydney and Melbourne, but also encouraged geological research and the organization of state geological surveys and museums maintaining rock and mineral collections.

As in many other countries, nineteenth-century women amateurs in Australia made their contributions to science predominantly in the biological fields, but a few are known to have been interested and active in other areas, including geology. Those familiar with the contributions of nineteenth-century British women to the earth sciences would look in vain for a similar pattern, even on a much smaller scale, among their colonial cousins. Given the very considerable differences in the major thrust of geological work in the two countries, the reasons are fairly clear. From the early decades of the nineteenth century, a considerable amount of paleontological work was taking place in Britain, its underlying purpose being to establish stratigraphical succession throughout the country; amateurs, women as well as men, were able to make significant and in some cases very important contributions to the fossil record, which the country's leading male geologists were glad to receive and in some instances depended on. A considerable advantage for the British amateurs was the presence of a widespread network of field clubs and natural history societies, most of them open to women, that supported and encouraged the

paleontological work of many amateurs.⁷⁰ In Australia, on the other hand, geological work, including that of amateurs, for much of the century placed a heavy emphasis on the strictly utilitarian and economic aspects of the science, which was largely concerned with the search for minerals, and gold especially. Even the able and well-trained men of the colonial geological surveys were strongly pushed by local government officials to concentrate their efforts more on prospecting than on scientific investigation.

Much basic geology was accomplished all the same, and by the second half of the century university professorships of geology were being established, the first at the University of Sydney in 1869. By the mid 1890s women there were attending classes in the geology department, which was then led by the outstanding and progressive T. W. Edgeworth David; but numbers of women students were low for several years, and none appear to have published before 1900 in journals indexed by the London Royal Society. The field was long considered a man's sphere.⁷¹

Nevertheless, by the later decades of the century, a few Australian women amateurs working independently were adding fossil finds to the record,⁷² and at least one, GEORGINA KING⁷³ (1845–1932), tried to get her ideas on questions in geology into print. Unfortunately, King was considerably handicapped by her lack of basic, systematic training and her poor choices of advisers and reference material. Hence she was inadequately equipped to develop any capacity for critical judgment and to avoid seriously flawed conclusions in her bold but rash ventures into the more theoretical side of geological work. As a consequence, despite her persistent efforts, she was gently but firmly shut out of the mainstream scientific community; one can only conclude that she falls into the class of eccentric enthusiasts on the fringes of science. All the same, King, a colorful personality in the story of early efforts by women in Australian geology, remains a figure of continuing interest to those in the field of women's studies.

Born in Fremantle, Western Australia, on 6 June 1845, Georgina was the daughter of the Rev. George King, an Anglican clergyman educated at Trinity College, Dublin, and his wife, Jane. Four years before Georgina's birth, the family emigrated to Western Australia, in large part because of George King's interest in the Aborigines, their customs, and the sorry conditions they then endured. During his six years in Fremantle he conducted a vigorous mission among both the settlers and the Aborigines and established an institution to help the native peoples. His wife, already a competent artist, acquired skills in taxonomy; she painted the region's wildflowers and preserved birds and reptiles. Not surprisingly, with this home background Georgina's interests in natural history developed at an early age; further encouragement was provided by her father.

In 1849 the Kings moved to Sydney, George King taking the temporary charge of St. Andrew's Cathedral Parish. As she was growing up, Georgina came to know several of Sydney's men of science, and her own interest increased, centering more and more on geology. Particularly influential at this critical period in her development was George Bennett (1804–1893), curator of the Australian Museum and also a physician, who numbered the King family among his patients. Primarily a zoologist, Bennett carried out extensive research on the anatomy, development, and classification of Australian monotremes and marsupials and wrote several natural history books. His geological interests were largely limited to vertebrate paleontology, in which area he carried out valuable collecting work for British Museum naturalist Sir Richard Owen.

When she first became active in natural history studies in the 1860s, Georgina explored along the shores of Port Jackson, just north of Sydney, in the gullies and along the heights of the Blue Mountains in the city's hinterland and in the western districts of New South Wales, much of it rugged country. She energetically collected both live plants and fossils and developed considerable skill. During a visit to England, Ireland, and continental Europe in 1881, she studied rock formations and again collected specimens. Seven years later she attended the first Science Congress held in Sydney.

By the 1890s she was sending plant specimens to Ferdinand von Mueller, government botanist of Victoria. Specially noteworthy was her 1896 find of a specimen of *Boronia floribunda*, a dwarf, flowering shrub of the rue family that had been overlooked by collectors since very early explorations. The credit accorded her by von Mueller for this find was the only recognition she ever received in a mainstream scientific publication.

About this time Georgina's geological contact was paleontologist Sir Frederick McCoy (1817–1899) of the University of Melbourne. A forthright and dogmatic Irishman, McCoy rarely undertook fieldwork

himself, preferring to rely on laboratory examination of fossils collected by others to develop his ideas on stratigraphic succession. By the 1890s Australia's professional geologists had largely resolved the many earlier arguments on ages and successions of the continent's rocks, but McCoy, something of a loner, disagreed with the conclusions of several of the leading field geologists of the day. His controversial stand over the age of Australian coals led to an argument that raged on for thirty years, and despite incontestable evidence to the contrary, he never acknowledged his error. He was a poor choice of adviser for Georgina King.

Sydney geologist and geology historian David Branagan in his 1982 paper set out a detailed and balanced analysis of Georgina King's contributions, pointing out the influence of McCoy's ideas evident in her publications.⁷⁴ For instance, in her "Mineral Wealth of New South Wales and Other Lands and Countries," first published in 1895, she repeats McCoy's arguments concerning the age of the major eastern Australian coal deposits, claiming that they are younger than those of Europe.⁷⁵ And her suggestion that diamonds began their existence as marine organisms, based on McCoy's idea that they were "fossilized vegetable secretions,"⁷⁶ went somewhat beyond what most earth scientists would have been willing to contemplate even in 1895; acceptance would have been even less likely in 1923, when she cited W. L. Bragg's X-ray analysis of the diamond as proof that "it is not a crystal, but was a marine organism and the layers were what were its gills."⁷⁷ Likewise her somewhat confused theory that the continent's mineral deposits, such as gold, tin, and iron sulfide, were intruded into alluvial deposits during a short but intense time of volcanism in the Tertiary period was hardly in accord with current thinking.

Georgina King also set out her conclusions about the indigenous peoples of Australia, their customs and rituals, where they migrated from, and what they brought with them. Here again she offered mainly material from other sources, including her father's 1868 articles in the *Australian Churchman* and information from Alan Carroll, founder of the Royal Anthropological Society of Australia. This society, now seen as having then been part of Australian science's "lunatic fringe,"⁷⁸ welcomed her into its membership and published her work in its journals.⁷⁹

Her many claims that other geologists plagiarized her ideas have been examined in detail and found wanting.⁸⁰ Not only did professional geologists not plagiarize her theories—most did not accept them. One might wonder why, when at least a few women were beginning to attend geology lectures at Sydney University in the 1890s, she did not take advantage of these. By then, however, she was close to fifty, set in her thinking, nursing grievances against several of the Sydney geologists, and also responsible for running the household for her retired and aging parents in the Sydney suburb of Homebush. A spirited woman, a keen observer of nature, and an able collector of scientifically useful materials, she is something of a sad and unfulfilled figure in the story of women's early efforts in science.

Georgina King was also interested in social concerns, such as the rights of minorities, and in various women's issues; for a time she worked in Sydney's slum areas. She was one of the early members of the Women's Literary Society and often presented her views on topics of current interest in the pages of the daily newspapers. During the First World War she worked for the Red Cross. She died at the age of eighty-seven in June 1932. Material concerning her publications, correspondence with scientists, manuscripts, and natural history specimens are held in the State Library of New South Wales, Sydney, the National Herbarium, Melbourne, and the Powerhouse Museum, a science and technology museum in Sydney.

Women in the Astronomical Community before 1900

Very few women took part in astronomical work in Australia before the turn of the century. Possibly the earliest published contribution by a woman was the lithographed drawing by botanical artist Mary Allport of the comet of 1843 seen over Hobart, Tasmania, which appeared in volume 2 of the *Tasmanian Journal of Natural Science, Agriculture, Statistics, &c.*⁸¹ Half a century later, when work began on the Australian contribution to the international *Astrographic Catalogue*, a few women were employed as plate measurers in Sydney and Melbourne; one of the earliest was Miss C. E. Peely, who worked at the Melbourne Bureau from 1898 to 1918.⁸²

With the establishing of the New South Wales branch (Sydney) of the British Astronomical Association in 1895 and the Victoria branch (Melbourne) in 1897, opportunities for women to take

part in astronomical activity in their communities increased, membership being open to women. The association's *Journal* report of the February 1895 inaugural meeting of the New South Wales branch stated that the large number of people attending included ladies. The name of one woman, Sydney resident Mrs. Jane Foreman, appears in the list of new members elected that year.⁸³ In March 1896, Miss Cecilia Maclelland of Waverley, Sydney, joined the association. She was elected librarian for the New South Wales branch and thus a council member during the 1899–1900 session, and she remained librarian for a considerable period. For at least two years she also took part in the branch's observational programs, contributing reports on meteors.⁸⁴ Miss Edith Dean, of Mosman, New South Wales, joined Cecilia Maclelland on the branch's committee in 1904, having become a member of the association two years previously.

At the Victoria branch a few women joined the association within the first year or two of its formation in 1897. Mrs. Rose S. Whiting of Hascombe on Mount Macedon, an exclusive hill station region about forty miles north of Melbourne, became a member in 1897; by 1900 she was elected to the council, an office she continued to hold in 1901 and again in 1904 and 1905. Rose Whiting was the wife of Richard Selmon Whiting, a well-to-do Melbourne solicitor. Although there is no indication that she carried out any observational work herself, it is perhaps worth noting that she had more than one astronomer neighbor. The Whiting property of Hascombe, which the family had owned since at least 1890, adjoined that of the enthusiastic amateur astronomer, and later politician, George Verdon. As a young man Verdon had been an honorary assistant to Robert Ellery, Victoria's first government astronomer, who also owned land and a summer residence on Mount Macedon. Verdon was a strong and influential supporter of astronomical work in the colony. His property of Alton, now listed in the National Trust Register, later changed ownership several times, for four years in the 1920s belonging to the Whitings.⁸⁵ Mrs. Elizabeth Tulloch of Moonee Ponds, a district of Melbourne, joined the Victoria branch in 1898; Miss Elizabeth Miller of Melbourne became a member in 1899.

Although clearly interested in the southern skies and in astronomical work in their communities, for the most part the women who joined the Sydney and Melbourne branches of the British Astronomical Association before 1900 appear to have participated as supporters and, in at least two cases, as council members eager to take part in the organizational work of the branches. Readily available sources suggest that Cecilia Maclelland's reports of meteor sightings were probably the only observational work by an Australian woman mentioned in an astronomical journal before 1900.⁸⁶

One further pre-1900 contribution to Australian astronomy by a woman—although the contributor was English, rather than Australian—was that of MARY ACWORTH ORR,⁸⁷ later EVERSLED (1867–1949), who published her short but very useful *Easy Guide to the Southern Stars* in 1897. Like Lady Jane Franklin before her (see above), Mary Orr was a temporary resident in Australia, spending only five years there, but she also had a strong and active interest in encouraging science among the public.

Born at Plymouth Hoe, Devon, on 1 January 1867, Mary was the fifth child and third daughter of Andrew Orr, a Royal Artillery officer, and his wife, Lucy (Acworth). Following Andrew Orr's death when Mary was three, the children and their mother joined their maternal grandfather, a Church of England clergyman; they lived first at Wimborne, Dorset, and then at South Stoke, near Bath. Mary received her early education from governesses and then studied languages and the arts in Germany and Italy. Her particular interests included astronomy, and when studying the writings of Dante during her stay in Florence in 1888–1890, she paid special attention to the many references in his poetry to astronomical events.

In 1890 the three younger Orr daughters and their mother joined their oldest sister already in New South Wales. Mary's now strong interest in astronomy quickly led her to make the acquaintance of John Tebbutt. Tebbutt, who had his own observatory at Windsor, west of Sydney, was then the leading astronomer in New South Wales, although formally an amateur. Since Mary found her efforts to familiarize herself with the southern stars and constellations considerably hampered by the lack of simple maps, she decided to produce her own. Her *Southern Stars* guide, with a foreword by Tebbutt, was published after she returned to England.⁸⁸

This booklet, Mary Orr's first astronomical publication, was her only work directly related to Australian astronomy, but her enthusiasm for the field continued to grow; over the years she carried out some very creditable research. In 1891, while in Australia, she had become a member of the California-based Astronomical Society of the Pacific, and on her return to England she decided to buy a telescope. She

also began to study mathematics, joined the recently formed British Astronomical Association, and took part in the association's 1896 and 1900 expeditions to observe solar eclipses. Starting in 1900, when she settled in Frimley, Surrey, she began observations on variable stars and the Moon using her three-inch refractor housed in a small observatory. Her first report appeared in 1904.⁸⁹

In 1906 plans were being made for her to carry out work on variable stars at the Dunsink Observatory, Dublin, but that same year she married astronomer John Evershed and soon after accompanied him to his new appointment as assistant director at the Kodaikanal Observatory in southern India. Set in the tropical scrub country of the Palani Hills, this observatory worked exclusively on solar studies. Although not formally a staff member, Mary Evershed joined in the studies. She concentrated particularly on active solar prominences and authored or coauthored two papers in the area;⁹⁰ her specially notable 1913 paper was read by her at a meeting of the Royal Astronomical Society when the Eversheds were on leave in London.

During her years in India, much of Mary Evershed's time was given to her early interest, her examination of Dante's writings. Her *Dante and the Early Astronomers*, a history of astronomy to Dante's time and an outstanding guide to Ptolemaic (Earth-centered) astronomy, provided explanations of the poet's many astronomical references and allusions.⁹¹ The book remains a standard reference work for Dante scholars.

After John Evershed retired in 1923, he and Mary lived in Ewhurst, Sussex. John continued his solar studies, but Mary's interests were by then centered on the history of astronomy. She was notably active in the Historical Section of the British Astronomical Association and brought out a number of historical papers. *Who's Who in the Moon*, an index of all named lunar formations, was produced by an international team that she had assembled.⁹² Mary Evershed died in Ewhurst on 25 October 1949, about two months before her eighty-third birthday, after some years of failing health.

EARLY WOMEN GRADUATES

In the quarter century between 1850 and 1874, Australia's three oldest universities were established in colonial capital cities: the University of Sydney in 1850, the University of Melbourne in 1853, and the University of Adelaide in 1874. Other universities came somewhat later: the University of Tasmania in 1893, the University of Queensland in 1901, and the University of Western Australia in 1913.

University of Adelaide

Of the first three, the University of Adelaide, although established twenty-four years after the University of Sydney and twenty-one after the University of Melbourne, was the first to award a science degree to a woman, Edith Dornwell, who was also the institution's first B.Sc. recipient, male or female.

The university had its origins in Union College, a college organized in 1872 by the Baptist, Congregational, and Presbyterian churches in South Australia to provide education past high school level for young men. The same year a wealthy livestock farmer and copper miner, Walter Watson Hughes, donated twenty thousand pounds to the new college, enough to fund its transition to university status. Incorporated and endowed by the legislature in 1874, the institution was formally inaugurated two years later; classes leading to the B.A. degree began the same year.

From the start the University of Adelaide was a progressive institution, as shown by its liberal point of view concerning women students. This outlook to a large extent reflected South Australia's somewhat more enlightened attitude toward women than that which persisted in the older Australian colonies. In 1879 the South Australian government established the first state secondary school for girls in Australia, the Advanced School for Girls in Adelaide. This school in turn acted as a catalyst to bring about the introduction of a much more rigorous academic curriculum in South Australia's private girls' schools, such as the Tormore House School in Adelaide, where botanical artist Rosa Fiveash (above) taught for a time. Thirteen of the fourteen women graduates from the University of Adelaide between 1885 and 1898 received their secondary education at the Advanced School, a notable demonstration of its effectiveness.

The university admitted women to all its classes from the start of its formal lectures in 1876. Most of the earliest students were nonmatriculated, and of the fifty-two in this group who attended lectures in 1876, thirty-three were women. Nevertheless, it must be acknowledged that as a whole, women were slow to take advantage of the opportunity offered. The general dearth of free or low-cost secondary education that would meet university entrance standards presented a formidable barrier, which the establishment of the Advanced School for Girls was only the first step in overcoming. In addition, despite South Australia's comparatively liberal reputation, social sentiment overall in the colony remained conservative in the matter of female education.⁹³

The first woman to matriculate at the University of Adelaide (in 1877) was Edith Agnes Cook, who went on to become the second headmistress of the Advanced School for Girls. The university obtained the right from the London government to confer degrees on women in 1881; regulations for the B.Sc. degree course were passed the same year, and the course became available in 1882, with enrollment starting in 1883. Edith Dornwell, the first woman science graduate, most likely never carried out any scientific research that resulted in published papers, but her place as Australia's pioneer among female science graduates suggests a brief sketch here of her life and work.

EDITH EMILY DORNWELL,⁹⁴ later RAYMOND (1865–1943), was born in New Zealand, one of at least three children of Bernard Dornwell, an immigrant from Hamburg, and his wife, Sarah. Bernard Dornwell earned a living by trading in horses.

At age fourteen, while still attending the State Central Model School, Edith won one of six scholarships provided by the state to allow able girls to attend the Advanced School for Girls. There she proved herself to be an outstanding student, always gaining top examination scores. In 1882 she and her fellow student Adela Knight passed the matriculation examination, Edith with honors in French, German, animal physiology, and modern history.⁹⁵ She began university studies the following year, enrolling in the B.Sc. course (possibly because she lacked the credentials in Latin and Greek required for the liberal arts course). Encouraged by professor of physiology Edward Stirling,⁹⁶ who also taught at the Advanced School for Girls, she completed the B.Sc. degree course in 1885 with first-class honors in physics and physiology. She was then twenty-one.

After graduating she taught mathematics, physiology, physics, and Latin, "besides the ordinary English subjects," at the Advanced School for Girls. A young woman of wide interests, she kept abreast of the issues and events of the day, including such matters as developments in science, nutrition, and women's education, as well as religion, although she was not a churchgoer. In politics she held strong views. Her friendly personality and sound, practical ideas on household management made her a good counselor and friend of her pupils, some of whom were close to her own age. In 1887 she moved on to become a resident teacher at Methodist Ladies' College in the Melbourne suburb of Kew, a school that has developed and expanded over the years and is now known, internationally as well as nationally, for its educational excellence and innovation. Edith Dornwell taught there for three years, her major department being science, although she taught every other course as well. Her tremendous enthusiasm provided a steady source of inspiration for her pupils. She was also a good disciplinarian, her tiny stature notwithstanding, and was highly regarded by her headmaster.

In 1890 she accepted the post of headmistress at Rivière College, a private school in Woollahra, an eastern suburb of Sydney. From there she attempted an even more ambitious move, applying for the position of principal at the newly established Women's College at the University of Sydney. But there the cards were probably stacked against her; the choice was made by a London committee, and the post went to University College, London, graduate Louisa MacDonald. In 1893 Edith Dornwell settled for a rather different situation, marrying Englishman Lionel Charles Raymond, with whom she moved to Fiji when he took a post there with Commonwealth Sugar Refineries. The Raymonds had two sons, who were sent back to Sydney for their secondary schooling, although even from a distance Edith continued her active interest in their educational progress. Both were very successful; one became a surveyor, and the other, who was a Rhodes scholar, an eye specialist. After Lionel Raymond retired, he and Edith returned to Sydney, taking up residence in the Epping district. Edith joined the Lyceum Club (an international club for professional women) and the National Council of Women. She is not known to have ever spoken of her university days. She died in 1943, when she was about seventy-eight.

University of Sydney

The University of Sydney, whose roots were in the earlier secondary school, Sydney College, was founded by the New South Wales legislative council in 1850 to provide a liberal education for the sons of the wealthier families of the colonial middle class. A blend of the old British and European universities, the institution initially focused mainly on classical and mathematical studies, but the curriculum gradually expanded to include science. The state's economic growth that followed the discovery of gold, in addition to a period of good agricultural production, led to a funding increase that allowed further expansion in the 1870s and 1880s. Women were admitted on an equal footing with men in 1881, not as a result of pressure from women's rights organizations in the colony, but in order to keep abreast of similar changes in a number of universities in Britain. The University of Sydney's first women graduates were Mary Elizabeth Brown, a New Zealander, and Isola Florence Thompson of Newcastle, New South Wales, who were both awarded B.A. degrees in 1885. The first woman science graduate, Fanny Hunt, received her B.Sc. in 1888, three years after Emily Dornwell received hers from the University of Adelaide (see above). Very important for women aspiring to a university education was the passage in 1880 of the Public Instruction Act, which started a state system of education in New South Wales ensuring compulsory, free, and secular education for both boys and girls from elementary to university entrance level.⁹⁷

One of the notable early women students was SARAH OCTAVIA BRENNAN⁹⁸ (1867–1928), the only child of Martin Brennan of County Kilkenny, Ireland, and his wife, Elizabeth, née McKeon, of Galway. Emigrating to New South Wales in 1859, Martin Brennan began his career in Australia in a mounted police patrol protecting the gold trains—at risk from the depredations of bushrangers—as they made their 110-mile journey from the Goulburn goldfields to the coast; he rose steadily through the ranks during his fifty years in the mounted police, latterly holding the post of barracks superintendent at Moore Park, Sydney.

Sarah was born on 14 April 1867 in Moruya, a coastal community about 150 miles south of Sydney, where her father was then a senior constable (figure 2.4). Of Catholic background, at age twelve she went as a boarder to St. Benedict's Convent of the Sisters of the Good Samaritan in Queanbeyan, a few miles east of Canberra; she passed the University of Sydney's junior public examination in 1883.⁹⁹ Never having had the chance of an education himself, her father, who followed her studies with great interest, took correspondence courses in Latin and French and matriculated along with Sarah at the University of Sydney in 1885. Although unable to attend lectures or take a degree, he continued to follow her courses throughout her studies. She received a B.A. in 1889 and an M.A. in classical philology and history in 1891. Over the next few years her interests moved to the sciences, particularly biology, and she became a member of the Naturalists' Society of New South Wales. She resumed studies in 1894 and was awarded a B.Sc. in 1898. Her paper on the reproductive system of the Australian earthworm *Digaster sylvaticus*, Fletch. (*Didymogaster sylvaticus* Fletch.) was read before the New South Wales Linnean Society the following year (see bibliography). The report, based on dissections and serial sections, augmented the account published by Sydney biologist Joseph James Fletcher thirteen years earlier.¹⁰⁰

A person of strong religious faith, Sarah Brennan chose as her life's mission the educational work of the Catholic Church. From 1901, shortly after a period of overseas travel, she lived at the Glebe Convent of the Sisters of the Good Samaritan and taught the now somewhat unusual combination of Latin and science in the Good Samaritan sisters' independent girls' high school in central Sydney, St. Scholastica's, a school that is still there. Teaching posts she held later were at the Randwick novitiate in Sydney and at the Balmain novitiate in a suburb to the west of the city. Over many years her special concern was the improvement of high school science instruction; at Balmain she helped in the training of sisters bound for teaching in that area.

Until his death in 1912, she remained very close to her father. After he retired in 1907, she encouraged him to publish his *Reminiscences*, an account of his early experiences in the goldfields.¹⁰¹ In 1920, shortly before her fifty-third birthday, she joined the Congregation of the Sisters of the Good Samaritan, taking the religious name of Sister Mary Elizabeth. A sympathetic person, always concerned for the

welfare of others, Sarah Brennan died on 8 January 1928, about three months before her sixty-first birthday, at Lewisham Private Hospital, Sydney, of coronary vascular disease.

Also a student at the University of Sydney in the 1890s was FLORENCE MARTIN¹⁰² (1867–1957). Florence was born on 25 December 1867 at Clarens, Potts Point, Sydney, the daughter of Sir James Martin and his wife, Isabella, née Long. The Martins were a distinguished and wealthy family, well known in Sydney social circles; Florence was the eleventh of their sixteen children, seven of whom survived to adulthood. Sir James, who had been brought to Australia from Ireland as a one-year-old child in 1821, was premier of New South Wales for the periods 1863–1865 and 1866–1868; from 1873 to 1886 he was the state's chief justice. His Australian-born wife, Isabella, was the daughter of a man sentenced to seven years' transportation who had arrived in Sydney in 1815 and later went on to become a successful publican and wine and spirits merchant; her brother William Long, a racehorse owner, was active in politics.

Florence Martin received her early education from a governess and then attended Mme Gilder's School, a girls' school in Campbell Lodge, Sydney. In 1891, at age twenty-four, she enrolled in the faculty of arts at the University of Sydney, taking an honors curriculum, which included physics courses. After completing her first year, she enrolled again in 1892 but within a short time switched her efforts to unpaid research directed by British physicist Richard Threlfall.

A former student of J. J. Thomson at the Cavendish Laboratory, Cambridge, Threlfall, young, enthusiastic, and energetic, was an outstanding experimental physicist. During the two years she worked with him, Florence Martin showed herself to be an accurate and reliable observer who could provide valuable assistance. In 1893, when her mother and sisters departed for Europe, she remained in Sydney to complete the research she had undertaken, namely an attempt to gather additional experimental proof of some of the predictions of the electromagnetic theory put forward by Scottish physicist James Clerk Maxwell some decades earlier and recently given its first experimental corroboration by Heinrich Hertz in Berlin. The results of Martin's work with Threlfall were reported as a joint communication to the Royal Society of New South Wales in 1893 and published in the *Philosophical Magazine* the following year (see bibliography).

Her physics studies continued in 1894–1895, after which, with a recommendation from Threlfall to J. J. Thomson, she spent about eighteen months in the Cavendish Laboratory. She was the second Australian and one of the few women to work in that laboratory before the turn of the century. The 1890s were a time of intense activity in physics research at the Cavendish, with pioneering advances being made in quick succession; these included obtaining final proof of the nature of the electron and the initial analysis of radioactive emissions. Martin's work on the expansion of gases was reported to the Cambridge Philosophical Society in 1895 (see bibliography).

By 1896 she was back in Sydney, where she resumed research in Threlfall's laboratory. They published two more joint papers, one a study of oxygen at low pressures and the other an investigation of hysteresis; but when Threlfall departed for England in 1898, she gave up physics. After several months as tutor to the University of Sydney's women students, she left academia and became housekeeper for her aging mother.

A few years later, her life changed direction. In 1905 she met the wealthy young American businessman and traveler William Cooke Daniels of Denver, Colorado, then preparing to leave for New Guinea. She shared her home with his fiancée, Cicele Banner, during his sixteen-month absence, and after the Daniels-Banner marriage in 1906 made her permanent home with them. The trio lived mainly at Daniels's estates in England and France but traveled widely until the outbreak of the First World War in 1914. Following the sudden death of William Daniels in 1918 and that of his widow soon after in the influenza epidemic, Florence became heir to the large Daniels fortune.¹⁰³ She continued to travel but from 1919 made her permanent home in Denver, living in a spectacular mountaintop residence outside the city. Her younger sister Emily, also unmarried, often joined her for the summers; they both spent winters in London, Emily's home, where she brought up two sons of her deceased sister, Constance Martin Arden.

Florence became a prominent figure in Denver society. A patron of the arts, she endowed the still-existing Cooke-Daniels Memorial Lecture Fund at the Denver Art Museum and also gave a large area

of parkland to the city as a memorial to William and Cicele Daniels. Part of the Denver Mountain Park System, Daniels Park has provided a natural high-plains habitat, mainly for bison, since the 1930s. Florence Martin died in Denver on 27 October 1957, two months before her ninetieth birthday; she was buried in London. Her estate of over two hundred thousand dollars was left to a niece.

One other late nineteenth-century Sydney woman who went on to a short but fairly productive research career in the sciences was neurologist LAURA ELIZABETH FORSTER¹⁰⁴ (1858–c. 1916). Laura was the sixth of eight children of New South Wales politician and man-of-letters William Forster and his first wife, Eliza Jane, née Wall. William Forster (1818–1882) was the son of an English military family that settled near Sydney in 1829; his wife, Eliza (c. 1830–1862), came from the Parramatta district on the western outskirts of Sydney. One of the pioneers of harsh but promising regions, Forster had acquired large landholdings by the 1850s, particularly in the Moreton Bay region of Queensland. Active in politics for most of his life, he served as premier of New South Wales for a short period in 1859–1860.

Little is known of Laura's early life, but her mother died when she was four, and eleven years later her father remarried, his second wife being Maud Julia, née Edwards, from the small town of Castle Cary in Somerset, about twenty miles south of Bath. Following William Forster's death in 1882, Laura's stepmother returned to England accompanied by her daughter Enid. In 1889, Maud Forster married John Burn Murdoch, from Edinburgh, a captain in the Royal Engineers, and the family took up residence in Devon.

Thus in 1887, when Laura Forster enrolled at Bern University, she had close family connections well established in England. She studied for twelve semesters at the Pathological Institute, carrying out research on muscle spindle fibers (see bibliography) under the guidance of pathologist Theodor Langhans; her careful examination of sections of these neuromuscular bundles was well received by fellow neurologists.

Following the award of her M.D. degree from Bern University in 1894, Laura moved to Britain where, by 1895, she acquired British qualifications; she was one of eleven Australian women to obtain the triple qualification of the Scottish Corporations before 1900, becoming Licentiate of the Royal College of Physicians and Surgeons of Glasgow and of the two Edinburgh colleges: the Royal College of Physicians and the Royal College of Surgeons of Edinburgh.

By 1900 she had established a practice in Oxford and was appointed a medical officer at the Cutler Boulter Provident Dispensary, Oxford. She also made contacts with Oxford University's physiologists and neurologists who, from time to time, provided her with research opportunities. In 1902 she published a further study of muscle spindle fibers, work done in the university's physiological laboratory with guidance from physiologist Gustav Mann. This was followed by a 1907–1908 paper reporting a histological study of tubercular human lymphatic glands carried out in the pathological laboratory of the University Museum; here again she had advice from Gustav Mann. A few years later, her interest having been drawn to the effects of ovarian disease in insane women on their offspring, she accepted the suggestion of London neuropathologist Sir Frederick Mott that she carry out a histological examination of the ovaries of mentally ill patients. This research, an examination of ovaries in one hundred cases, was most likely the last she did in Britain; it was carried out at the pathological laboratory at Claybury Asylum, London County Council Asylums. She left Britain before the outbreak of the First World War and died before 1917. Sir Frederick Mott published her ovarian study report, which she gave to him before she left, in 1917. The relationship between brain and sexual glands was a subject of considerable interest about this time, and a few years later Mott used her large collection of section specimens in a wider study in psychopathology.¹⁰⁵

Despite her limited opportunities, dependence on expert direction, and modest output of published work, Laura Forster was known among her fellow neurologists and pathologists as a skillful, painstaking, and dependable microscopist.¹⁰⁶

University of Melbourne

In 1853, three years after the founding of the University of Sydney, the younger colony of Victoria established its own institution, the University of Melbourne.¹⁰⁷ A quiet, provincial town until the gold

discoveries of 1851, Melbourne, within the next year or two, grew to a city of fifty thousand, a population comparable to that of Sydney; its port served the richest goldfields in the world.

State funding for the new university was generous. Although student numbers were low for several years because of the state's lack of preparatory schools, by the 1870s the institution had an outstanding medical school, modeled after the best schools in Scotland and continental Europe. Student enrollment doubled during the 1880s, the science curriculum was improved, and research facilities were expanded. When women were first formally admitted in 1881, degrees were offered in three areas: liberal arts, medicine, and law—although only liberal arts was open to women. The university's first woman graduate, Bella Guerin, received her degree in 1883.¹⁰⁸ Entrance to the medical school came in 1887, following a stiff fight by Lilian Helen Alexander and Helen Sexton, the first two aspiring female medical students. The university's first female science student, Leonora Little, received a B.Sc. in 1893.

LEONORA JESSIE LITTLE,¹⁰⁹ later WILSMORE (d. 1945), brought out her first paper in 1893 (see bibliography). A broad survey of published work and therefore not listed in the Royal Society *Catalogue*, it discussed the origins, geographical distribution, and changes through time of Australia's flora and fauna. Undoubtedly a reflection of her undergraduate interests, the survey appeared in the *Victorian Naturalist* in 1893, the same year she was elected a member of the Victorian Naturalists' Club.¹¹⁰

Readily available information about her life and work is sketchy, but we know that she was the daughter of Melbourne merchant Dugald Little, an immigrant from Scotland, and she was probably born in the 1870s in Melbourne. After receiving her B.Sc. in 1893, she continued her studies and was awarded an M.Sc. in 1895. On 28 June 1894 she married Norman Thomas Mortimer Wilsmore, son of a Melbourne solicitor and a fellow student at Melbourne University, who had received an M.Sc. (chemistry) in 1893.

The Wilsmores then spent three years in London, where Norman Wilsmore took up a research post with Sir William Ramsay and J. Norman Collie at University College. Three years in Göttingen followed and then a year in Zurich, Norman working with Walther Nernst at the University of Göttingen and Richard Lorenz at the Federal Polytechnic in Zurich. In 1903 the family returned to London, where they stayed for the next ten years.

In 1904, perhaps after her only child, a son, had reached school age, Leonora returned to academic work, enrolling at University College. Under the direction of James Peter Hill, Jodrell Professor of Zoology at University College from 1906,¹¹¹ she studied a collection of Actinaria (sea anemones) brought back from Australia by Hill. She described four new species of these polyp-forming animals in a paper published in the Linnean Society's *Journal* in 1909 and three more new species in a second paper, which appeared two years later.¹¹² She returned to Australia in 1913 when her husband accepted the foundation chair of chemistry at the new University of Western Australia, Perth, and after that did no more scientific research. It would have been surprising if she had, since laboratory facilities, except for the needs of undergraduates, were nonexistent at the new institution in its early years. Norman Wilsmore returned to London to carry out war work in the British Department of Explosives Supply in 1917–1919, but there is no record of Leonora having accompanied him. She lived in Claremont, Western Australia, until her death on 27 May 1945, five years after that of her husband. The Norman Thomas Mortimer Wilsmore Research Fund that she established in his memory supports research in pure and applied chemistry by visiting research fellows at the University of Melbourne.

Of the early Australian women of science discussed here, the most distinguished was GEORGINA SWEET¹¹³ (1875–1946), the University of Melbourne's first woman associate professor.

Born in the Brunswick district of Melbourne on 22 January 1875, Georgina was the elder of two daughters of George Sweet and his wife, Fanny, née Dudman, both of them immigrants from England. George Sweet, a plasterer by trade and later manager of the Brunswick Brick, Tile and Pottery Company, was a self-educated man and a keen amateur geologist. A fellow of the London Geological Society, he amassed a large and exceptional fossil collection. For many years he worked in the Mansfield region, about seventy miles northeast of Melbourne, collecting for Irish paleontologist Sir Frederick McCoy, professor of natural science at the University of Melbourne; in 1897 he was second-in-command on the Funafuti expedition.¹¹⁴

As girls, Georgina and her sister, Elizabeth, helped their father in his paleontological work, and he encouraged Georgina's interest in science. She attended Parkville Ladies College and went on in 1892 to the University of Melbourne, where she concentrated on zoology; her principal teacher was Sir Baldwin Spencer, a strong advocate of the study and preservation of Australian native fauna, the area in which she was soon to specialize.¹¹⁵

Awarded a B.Sc. in 1896, Georgina Sweet then taught for eleven years in several of Melbourne's leading secondary schools, while also working as a demonstrator in biology and carrying out research in the University of Melbourne's School of Biology. She received an M.Sc. in 1898 and continued on to doctoral work, supported in part by a MacBain research scholarship.¹¹⁶ Her D.Sc. was awarded in 1904.

During this period she began her studies on the anatomy of some Australian amphibians, in particular an examination of the common "green" frog of Victoria, *Hyla aurea*.¹¹⁷ Her report on the anatomy of Australian earthworms, the subject of her M.Sc. research carried out under the guidance of Baldwin Spencer, was read before the London Linnean Society in 1900 (see bibliography). Her most important research was her doctoral work, also carried out under the direction of Spencer: a detailed study of the anatomy of the Australian marsupial mole *Notoryctes typhlops*, including a special investigation of its degenerate eye, it was published in several parts between 1899 and 1907.¹¹⁸ Following this she brought out a description of the African mole, *Chrysochloris hottentota*, and of *Chrysochloris asiatica*.¹¹⁹ (See also the section on scientific illustrator Rosa Fiveash, above.)

In 1908 Georgina Sweet was appointed lecturer and demonstrator in biology at the University of Melbourne, having served during the preceding seven years as lecturer in biology at Queen's College, a university-affiliated college established in 1888 by the Wesleyan Methodist Church. By then she had developed a strong interest in parasites, in particular endoparasitic worms, that attacked Australian stock and native fauna. With the help of a government research scholarship, she began the work in this area, which was to occupy her for the rest of her career; the cooperation of the chief veterinary officer of the Ministry of Agriculture and assistance from a former minister of agriculture, as well as from the University of Melbourne's biology department, eased her entry into the field. Her first two papers, published in 1908 and 1909, presented a full review of the literature record of parasites known to that date. The work won the David Syme research prize.¹²⁰

From 1909, when she was appointed lecturer in parasitology at the university's Veterinary School, she divided her time between that school and the biology department. She brought out a considerable number of reports and reviews, many of them being reissued as federal government booklets after their initial publication in scientific journals. On overseas leave in 1913–1914, she expanded her investigations of worm nodules in cattle for the federal government, gathering data from several other countries. Undertaking a second journey in 1925–1927, she collected data from Asia on the buffalo fly for the Australian Council for Scientific and Industrial Research. Both these studies were important pieces of work of considerable value to the British Commonwealth community as a whole; by then Georgina Sweet was widely recognized as Australia's leading parasitologist.¹²¹

Although a person of great energy and an outstanding teacher, she nevertheless found her dual appointment a strain; the frequent absences of more senior staff increased her load greatly, a difficulty that became more pronounced throughout the First World War years. During Baldwin Spencer's absence for four months in 1916–1917, she was acting professor, the first woman to hold an academic post of this level in Australia. In 1919, when Spencer was about to retire, she applied for the position of department chair but, despite strong support from colleagues, failed to win the appointment. One year later she became the University of Melbourne's first woman associate professor.

By then overwork was beginning to take its toll, and although she was only forty-five, health difficulties, combined with depression caused by the recent deaths of both her mother and her sister, caused her to take sick leave in 1921. In 1924 she retired from the Department of Zoology, retaining only a part-time lectureship in the Veterinary School; in 1926 she retired altogether, although she still did some teaching as an honorary lecturer.

As well as her research and teaching, Georgina Sweet was active in several other areas over the years, both academic and in the wider community. Endowed with good organizational skills, she served on three faculties: science, agriculture, and the veterinary faculty; in 1924 she was acting dean of the

latter. She was a council member of the Graduates' Association and a member of the executive committees of the Science Club and the Women Students' Club. In 1912 she served as honorary secretary of the University Union, and in 1936 she was elected the first woman member of the University Council. Over many years she campaigned energetically for the establishment of University Women's College, an independent, nondenominational residence hall for women, affiliated with the university but with its own tutorial system. Although she herself never considered she was at a disadvantage because of her sex, she strongly championed the rights of women in academia and pushed to have women admitted to the university senate. A foundation member of the Victorian Women Graduates' Association (an influential group established in 1920), she served as its representative on national and international bodies. In 1930 she became the first president of the Pan-Pacific Women's Association. She was also active in several state and national scientific groups, including the Field Naturalists' Club of Victoria, the Royal Society of Victoria, and the Australian Association for the Advancement of Science.

Brought up in the Methodist Church, where her father was a lay preacher, Georgina Sweet had strong religious beliefs. She served as president of the Australian section of the YWCA from 1927 to 1934 and then for a time as vice president of the International YWCA. In 1935 she was honored with an OBE (Officer of the Order of the British Empire). She enjoyed travel, and in addition to her largely professional journeys, she made a long trip in 1922 through Africa, from the Cape to Cairo, with her friend Jessie Webb.¹²² She died in Canterbury, Melbourne, on 1 January 1946, three weeks before her seventy-first birthday. Among her bequests were funds to the university to endow fellowships in geology and zoology, a scholarship to support students in social work doing field assignments, and the Elizabeth Sweet Fellowship in medicine.

Biologist and educator ADA MARY A'BECKETT,¹²³ née LAMBERT (1872–1948), a second early woman science graduate of the University of Melbourne whose journal publications are listed in the Royal Society *Catalogue*, was born on 18 May 1872, in the Norwood district of Adelaide. The elder daughter of John Henry Lambert, a Presbyterian minister, and his wife, Helen, née Garrett, she attended the Advanced School for Girls in Adelaide¹²⁴ and then continued her education at the University of Melbourne. An outstanding student, she held, successively, a number of undergraduate awards—an Annie Grice Scholarship, 1892–1893, a Wyselaski Scholarship in biology, and a final-year honors scholarship in biology.¹²⁵ After receiving a B.Sc. in 1895, she completed a further two years of study, also serving as a demonstrator in biology and carrying out research on the anatomy of the Australian land leech. Her findings were published in two substantial papers in the *Proceedings* of the Royal Society of Victoria in 1898 and 1899 (see bibliography). She was awarded an M.Sc. in 1897.

Ada Lambert's science teaching career began while she was still an undergraduate. Starting in 1893 at Merton Hall (later the Melbourne Church of England Girls' Grammar School), she held a succession of appointments at various schools for girls in Melbourne and in Geelong (about forty miles to the southwest); in 1898–1899 she also lectured in botany at the Working Men's College, Melbourne, now the Royal Institute of Technology, with university status since 1992. For three years (1898–1901) she was a senior demonstrator in biology at the University of Melbourne, from time to time substituting as lecturer for absent faculty members, including Baldwin Spencer when he went on his 1901 study tour of Aboriginal peoples in central Australia.¹²⁶

Following her marriage to Thomas Archibald a'Beckett, a solicitor, she gave up her professional activities for a time, but in 1912, two years after the birth of her third son, she went back to teaching, mainly at the Melbourne Church of England Girls' Grammar School. With the coming of the First World War and the departure of many university staff members to military service, she once again became a demonstrator in biology at the University of Melbourne. By then she was well known as a very competent teacher, with a clear lecturing style. From 1921 until her retirement at age sixty-five in 1937 she served as head of the biology department at Scotch College, a Melbourne high school providing instruction to university entrance level.

During the years when her main concern was the upbringing of her young sons, Ada a'Beckett became extensively involved in the work of a group of Melbourne women whose special interest was the fostering and development of an early childhood education program. An outstanding organizer, skillful, energetic, well qualified through her educational experience, and well positioned in Melbourne society, she continued to make important contributions to this movement after she had returned to teaching and

throughout most of her retirement. From 1908 she held a succession of influential committee posts. A vice president of the Free Kindergarten Union of Victoria from its founding in 1908, she served as its president for nineteen years (1920–1939) and as life president after that; she also took a lead in establishing in 1916 the Kindergarten Training College at Kew, Victoria, contributing to the development of its curriculum, serving as lecturer in physiology and hygiene from 1920 to 1923 and as president of the college council from 1926 to 1929. Her writings include a sketch of the development of the Free Kindergarten Movement in Victoria and a contribution to a book on Australian preschool centers.¹²⁷

By the 1930s the importance of free preschool education centers to Victoria's children was clear, and the group of Melbourne women who had started the movement sought to expand the service beyond their state. Their plan for demonstration centers in each of Australia's state capitals was sent to Canberra and discussed with the director general of health. The result of this effort, in which Ada a'Beckett played a leading role, was the founding of the Australian Association for Pre-school Child Development and the establishing of a network of model preschool centers known as the Lady Gowrie Centres. The six demonstration centers, opened by Lady Gowrie during the period 1939–1940, were the first steps toward an extensive range of services for young children.¹²⁸

Ada a'Beckett was active in many women's organizations, including the Victorian Women Graduates' Association, the National Council of Women, the Victoria League, and the Melbourne branch of the Lyceum Club (an international club for professional women), of which she was president from 1926 to 1928. In 1935 she was honored for her many public services with the award of a CBE (Commander of the Order of the British Empire).

Widowed in 1930, she died of cancer on 20 May 1948, two days after her seventy-sixth birthday, at her home in East St. Kilda, Melbourne. The Ada Mary a'Beckett Award, an annual undergraduate scholarship based on funds donated by her friends and colleagues, commemorates her contributions to the development of preschool education. It is available annually to students, male and female, who are working toward the bachelor degree in early childhood education and who have already achieved distinction in some aspect of the course. In 1942 a kindergarten in a low-income housing community, the Ada Mary A'Beckett Children's Centre at Fisherman's Bend, Port Melbourne, was named after her.

SUMMARY

The story of these nineteenth- and early twentieth-century women in Australia who were engaged in natural history and other scientific work might be viewed as providing a glimpse of many aspects of the country's striking development during the last half-century of the colonial period.

Those whose lives and careers are sketched here worked in a wide range of settings, from raw, immigrant communities in newly settled country to advanced, urban, scientific laboratories. The succession gradually progresses from largely self-taught collectors Georgiana Molloy in Western Australia and Amalie Dietrich in northern Queensland in the 1840s and 1860s to well-trained zoologist Georgina Sweet, who was engaged in her highly specialized anatomical studies at the University of Melbourne by the turn of the century. The sampling also includes a number of impressively talented and successful scientific illustrators and botanical artists, from the early pioneers to the meticulous Rosa Fiveash and the powerfully dramatic Ellis Rowan.

The collecting and the work of pictorial recording and illustrating by women was part of a general and hardly surprising response to the exciting and inspiring challenges and opportunities in natural history investigations that this new land presented to settlers and the many interested men of science in Britain and continental Europe. The striking beauty and variety of the Australian flora, with so many new species, and the strange, hitherto unknown animals aroused intense interest in the Old World and much demand for specimens, both living and preserved, and for accurate scientific illustrations.

Australian universities began accepting women at much the same time as did several in Britain, the country of origin of the great majority of the early settlers. This was noticeably earlier than universities in some continental European countries such as Germany and Austria. In Australia, as elsewhere, a sizable hindrance was the lack of secondary schools for girls, a difficulty that was only

beginning to be overcome by the 1880s. Interest among women in Australia for higher education grew only slowly, and, in contrast to the situation in Britain, little pressure was exerted by women's groups.

Only one woman in this selection, Georgina Sweet, was engaged in both scientific research and university teaching over a long period. Two, Sarah Brennan and Ada a'Beckett, had lengthy careers as secondary-school teachers and as teacher trainers, while a'Beckett spent several years as demonstrator at university level as well. Florence Martin and Leonora Little each carried out creditable academic research over a short span of years. The others might be thought of as being primarily either assistants or field-workers for the professional scientific community and other established specialists, or independent naturalists and artists eager and able to find and formally report and record their discoveries. Taken all together, their wonderfully colorful stories form a bright tapestry depicting the experiences of a subgroup among the pioneers of science in Australia.

NOTES

1. Papers by two additional Australian women, amateur botanist Jessie Louisa Hussey and zoologist Leonora Jessie Little, have been added to the bibliography.

2. See, for instance, Australian Government Culture and Recreation Portal, European discovery and the colonisation of Australia, www.cultureandrecreation.gov.au/articles/australianhistory/ (Feb. 2009); C. M. H. Clark, *A Short History of Australia*, new ed. (London: Heinemann, 1969).

3. Alexandra Hasluck, "Molloy, Georgiana (1805–1843)," in *Australian Dictionary of Biography*, vol. 2 (1967), 244–45, and "Molloy, John (1780–1867)," *Australian Dictionary of Biography*, vol. 2 (1967), 245; Rica Erickson, "Georgiana Molloy," in *200 Australian Women, a Redress Anthology*, ed. Heather Radi (Broadway, NSW: Women's Redress Press, 1988), 8–9; Ann Moyal, "Collectors and illustrators: Women botanists of the nineteenth century," in *People and Plants in Australia*, ed. D. J. and S. G. M. Carr (Sydney: Academic Press Australia, 1981), 333–56, on 334–38; Marnie Bassett, "Augusta and Mrs. Molloy," in *People and Plants in Australia*, 357–73.

4. [Lady] Marnie Bassett, *The Hentys: An Australian Colonial Tapestry* (London: Oxford University Press, 1954, 1955, republished Parkville: Melbourne University Press, 1962); [Dame] Alexandra Hasluck, *Portrait with Background: A Life of Georgiana Molloy* (Oxford and Melbourne: Oxford University Press, 1955, reprinted 1966, reprinted North Fremantle, WA: Freemantle Arts Centre, 2002).

5. Ray Sumner, *A Woman in the Wilderness: The Story of Amalie Dietrich in Australia* (Kensington: New South Wales University Press, 1993); Sophie C. Ducker, "Australian phycology: The German influence," in *People and Plants in Australia*, 116–38, on 126–27; Ann Moyal, "Collectors and illustrators," in *People and Plants in Australia*, 338–42; C. H. J. M. Franzen, L. B. Holthuis, and J. P. H. M. Adema, "Type-catalogue of the Decapod Crustacea in the collections of the Nationaal Natuurhistorisch Museum, with appendices of pre-1900 collectors and material," *Zoologische Verhandelingen* (December 1997): 229–30.

6. Dietrich's spider collections were the basis for Ludwig Koch's two-volume work, *Die Arachniden Australiens: nach der Natur* (Nürnberg: Baur & Raspe, 1871–1890) with additional notes and conclusion written by Eduard von Keyserling. The work is still a major reference for Australian species. Entomologist Koch published extensively on spiders, including collections from Siberia, Egypt, and Abyssinia; Graf Eduard Keyserling (1855–1918), a prolific author well known to students of late nineteenth- and turn-of-the-century social literature, also had interests in natural history.

7. Charitas Bischoff, *Amalie Dietrich: ein Leben* (Berlin: G. Grote'sche, 1909; English tr. *The Hard Road: The Life Story of Amalie Dietrich, Naturalist, 1821–1891*, trans. A. Liddle Geddie (London: Martin Hopkinson, 1931).

8. See the reviews by Georg Pfeffer (1854–1931), curator of the Hamburg Natural History Museum, *Hamburger Correspondent*, 27 November 1909, and 13 December 1912; quotations (in English translation) from both of these reviews are given by Sumner, *Woman in the Wilderness*, 71–72, 84–85.

9. See Karl Sofus Lumholtz, *Unter Menschenfressern. Eine vierjährige Reise in Australien* (Hamburg: Verlagsanstalt und Druckerei Actien-Gesellschaft, 1892) and also Sumner, *Woman in the Wilderness*, 9–10.

10. Christoph Luerssen, "Zur Flora von Queensland. Verzeichniss der von Frau Amalie Dietrich in den Jahren 1863 bis 1873 an der Nordostküste von Neuholland gesammelten Pflanzen, nebst allgemeinen Notizen dazu," *Journal des Museum Godeffroy* Heft 6 (1874): 1–22, Heft 8 (1875): 101–22; Karl Domin, *Beiträge zur Flora und Pflanzengeographie Australiens* (Stuttgart: E. Schweizerbart, 1915).

11. See Karl Müller, "Beitrag zur ostaustralischen Moosflor," *Linnaea* Bd. 35 (1867–68): 613–26; "Musci Australici praesertim Brisbanici," *Linnaea* Bd. 37 (1872): 143–62.

12. See Otto Finsch, "Über die von Frau Amalie Dietrich in Australien gesammelten Vögel," *Verhandlungen des königlichen kaiserlichen zoologischen und botanischen Gesellschaft in Wien* (1 May 1872): 315–40; also published as a twenty-six-page booklet (Wien, 1872). One of Germany's leading ornithologists, Finsch (1839–1917) traveled extensively throughout the southern Pacific and in western Siberia. He was director of the Museum of Natural History and Ethnology, Bremen, in 1872 and later held similar positions in Leiden and then Braunschweig.

13. Many of Dietrich's algae specimens were identified and described by algologist Otto Sonder (1812–1881), a successful Hamburg pharmacist and author or coauthor of a number of major works on algae. Dietrich's friendship with the Sonder family dated from her days of collecting in northern Germany, a time when Sonder's interests were still focused on the wild land plants of the Hamburg region described in his 1851 *Flora Hamburgensis*.

14. Virchow's report on these materials was to have been published in the tenth issue of the *Journal des Museum Godeffroy* in 1876, but the work remained incomplete at the time of his death in 1902. It was brought out three months later with a two-page foreword by the editor L. Friedrichsen of Hamburg and consisted of drawings, photographs, and tables of skeletal and skull measurements made by Virchow, as well as a color lithograph of an artifact collection; these were set out according to Virchow's notes and sketches. See Prof. Dr. Rudolph Virchow, "Australier. 20 ethnographische und anthropologische Tafeln, ausgeführt nach Anweisungen und Zeichnungen," *Journal des Museum Godeffroy* (1902), 3, Heft 10: 275.

15. F. Pitcher, "A student of fungi—Mrs. Flora Campbell Martin's work," *Victorian Naturalist* 42 (1925): 176–77; fragments of information collected from volumes 1–12 of the *Victorian Naturalist*.

16. M. C. Cooke, *Handbook of Australian Fungi* (London: Williams and Norgate, 1892), vi–vii.

17. D. N. Kraehenbuehl, "Jessie Louisa Hussey," in *People and Plants in Australia*, 388–98.

18. See Mary R. S. Creese, *Ladies in the Laboratory II: West European Women in Science, 1800–1900* (Lanham, Md.: Scarecrow Press, 2004), 106–10.

19. Moyal, "Collectors and illustrators," in *People and Plants in Australia*, 349–53; Joan Kerr, "Ellis Rowan," in *200 Australian Women*, 53–54; "The Flower Hunter. Ellis Rowan," National Library of Australia, www.nla.gov.au/exhibitions/ellisrowan/young_lady.html and www.nla.gov.au/collect/treasures/ellis-rowan.html (April 2009 for both); Bee Dawson, *Lady Painters: The Flower Painters of Early New Zealand* (Auckland: Viking, an imprint of Penguin Books (NZ), 1999), 126–31. For a biography of Ellis Rowan see Margaret Hazzard, *Australia's Brilliant Daughter: Ellis Rowan, Artist, Naturalist, Explorer, 1848–1922* (Richmond, Victoria: Greenhouse Publications, 1984).

20. Anon., "Cotton, John (1802–1849)," in *Australian Dictionary of Biography*, vol. 1 (1966), 249–50. Cotton's *The Resident Song Birds of Great Britain* was published in 1835, with an enlarged edition (*The Song Birds of Great Britain*) in 1836. His list of Victorian birds appeared in the *Tasmanian Journal of Science* 3 (1848). These ornithological studies earned him fellowship in the Royal Zoological Society. Volume 1 of his three-volume work, *Beautiful Birds: Their Natural History, Habits . . .*, ed. Robert Tyas, illustrator James Andrews, appeared five years after his death (London: Houlston and Stoneman, 1854–1856).

21. Alice Lounsberry and Ellis Rowan, illustrator, *A Guide to the Wild Flowers* (New York: F. A. Stokes, 1899), introduction by N. L. Britton; *A Guide to the Trees* (New York: F. A. Stokes, 1900), introduction by N. L. Britton; *Southern Wild Flowers and Trees* (New York: F. A. Stokes, 1901), introduction by C. D. Beadle.

22. This well-known collection of butterflies and beetles of tropical northern Queensland and New Guinea was assembled by Frederick Parkhurst Dodd (1861–1937), one of Australia's foremost early entomologists; the collection is housed in the Queensland Museum, Brisbane. Born in Victoria on 11 March 1861, Dodd, a bank employee, moved in 1884 to Townsville, where he took up insect collecting. Ten years later he gave up paid employment to spend all his time on entomology. From 1904 he lived in the small, picturesque mountain village of Kuranda above the northern Queensland coastal town of Cairns. See <http://flyaqis.mov.vic.gov.au> (Nov. 2009).

23. M. Ellis Rowan, *A Flower Hunter in Queensland and New Zealand* (London: John Murray, 1898).

24. Andrew Garran and Frederic B. Schnell, *Picturesque Atlas of Australasia* (Sydney: Picturesque Atlas Publishing Co., 1886; reprinted 1887, 1888). Despite its impressive sales (50,000 copies), the enormous production costs of the *Atlas* meant that it was not a financial success for its publishers. Of incidental interest is the fact that Ellis Rowan's husband, Frederic Rowan, served on the publishing company's board. See Tony Hughes-d'Aeth, *Paper Nation: The Story of the Picturesque Atlas of Australasia 1886–1888* (Carleton, Victoria: Melbourne University Press, 2001).

25. Eric B. Sims, "Fiveash, Rosa Catherine (1854–1938)," in *Australian Dictionary of Biography*, vol. 8 (1981), 517–18, and "Rosa Catherine Fiveash," *South Australian Naturalist* 49 (1975): 44–47; Joyce Gibberd, "Rosa Fiveash," in *200 Australian Women*, 60–61.

26. See “R. A. Fiveash” in *Flinders Ranges Research*, www.southernaustralianhistory.com.au (April 2009). The scenic Flinders Ranges (figure 2.4), with their rugged cliffs, beautiful spring wildflowers, and mid-nineteenth-century copper mine relics, are now popular destinations for trail walkers and other visitors. Awe-inspiring, highly colored cliff faces bring a special interest to the Yudanamutana (or Yudamutana) district, part of which has become the Arkaroola Wilderness Sanctuary. Nearby is the Gammon Ranges National Park. The old mining town of Blinman to the south is now a quiet village. See www.abcmmaps.com.au/photogallery/RetailerPages/Arkaroola.htm (April 2009).

27. J. E. Brown, *The Forest Flora of South Australia* (Adelaide: E. Spiller, H. F. Leader, Government Printers, 1882–1890), illustrators H. B., R[osa] C[atherine] F[iveash] and C. H.

28. E. C. Stirling, “Description of a new genus and species of Marsupialia (*Notoryctes typhlops*),” *Transactions of the Royal Society of South Australia* 14 (1891): 154–87, 238–91, quotations from 187 and 285. Edward Stirling was educated at Trinity College, Cambridge, and received degrees in both natural science and medicine. Instrumental in founding the University of Adelaide Medical School and the first professor of physiology there, he was later the dean of medicine. His interests were wide, ranging across many fields, including anthropology, zoology, and exploration; he took part in several important scientific expeditions. His collection of Aboriginal artifacts was the largest of the time (see Hans Mincham, “Stirling, Sir Edward Charles [1848–1919],” in *Australian Dictionary of Biography*, vol. 6 [1976], 200–201).

29. E. C. Stirling, “Preliminary notes on a new Australian mammal,” *Transactions of the Royal Society of South Australia* 11 (1888): 21–24, and *Nature* 38 (1888): 588.

30. J. M. Black, *Flora of South Australia* (Adelaide: British Science Guild, South Australian Branch, 1922, and later editions); R. S. Rogers, *An Introduction to the Study of South Australian Orchids* (Adelaide: R. E. E. Rogers, Government Printer, 1911). The preface to the latter work and that to the second edition of Black’s *Flora* (1943–1957) both contain acknowledgments of the artistic contributions of Rosa Fiveash, although such acknowledgments are by no means uniformly found in works she illustrated.

31. John Burton Cleland, *Toadstools and Mushrooms and other Larger Fungi of South Australia*, 2 vols. in 1 (Adelaide: H. Weir and Frank Trigg, Government Printers, 1934–1935). One of Rosa Fiveash’s watercolor illustrations, entitled “*Clavaria australiana* Clel.,” appears on p. 265, figure 59 (1935). Both the specimen she used (one of a recently located Cleland collection) and her watercolor original have now been reexamined; thanks to her delicately detailed and accurately colored picture (poorly reproduced in publications), there appears to be little doubt that the compact, cauliflower-like specimen is in fact *Ramaria capitata* var. *ochraceosalmonicor*. See A. M. Young and N. A. Fechner, “Australian Coraloid Fungi I—*Ramaria capitata*,” *Australasian Mycologist* 26, no. 1 (2007): 37–50. The study provides a notable demonstration of the lasting scientific value of Rosa Fiveash’s outstanding illustrations. The original, bearing her signature, that was used in the work reported here is held by the State Herbarium of South Australia.

32. The Lord Tennyson referred to was the second baron, Hallam Tennyson (1852–1928), eldest son of the poet laureate. Appointed governor of South Australia in 1899, he went on to serve as acting governor-general of Australia from 1902 to 1903 (Roma D. Hodgkinson, “Tennyson, Hallam, 2nd Baron (1852–1928),” in *Australian Dictionary of Biography*, vol. 12 (1990), 194–95). Robert Barr Smith (1824–1915), a Scottish immigrant from Lochwinnoch, Renfrewshire, became a successful Adelaide businessman who supported worthy causes. Among his contributions was money to help defray the cost of an observatory at the summit of Mount Kosciuszko (Dirk van Dissel, “Smith, Robert Barr (1824–1915),” in *Australian Dictionary of Biography*, vol. 6 (1976), 153–54).

33. *Rosa Fiveash’s Australian Orchids: A Collection of Paintings by Rosa Fiveash*, text by Noel Lothian (Adelaide: Rigby, 1974; London: Hale, 1974).

34. Jennifer Phipps, *Artists’ Gardens: Flowers and Gardens in Australian Art, 1780s–1890s* (Sydney, London: Bay Books, 1986), 36–37; Geoffrey Thomas Stilwell, “Mary Morton Allport,” in *Dictionary of Australian Artists: painters, sketchers, photographers and engravers to 1870*, ed. Joan Kerr (Melbourne, New York: Oxford University Press, 1992), 14–15; Henry Allport, “Allport, Joseph (1800–1877),” in *Australian Dictionary of Biography*, vol. 1 (1966), 9–10; Caroline Jordan, “Progress versus the picturesque: White women and the aesthetics of environmentalism in colonial Australia 1820–1860,” *Art History* 25, no. 3 (2002): 341–57; Joan Kerr, “Mary Morton Allport and the status of the colonial ‘Lady Painter,’” *Papers and Proceedings of the Tasmanian Historical Research Association* 31 (1983): 3–17.

35. Among the Allport portraits in the Allport Library and Museum of Fine Arts, Hobart, is Mary Allport’s miniature (c. 1832) of John Glover, the art master whose style had so notably influenced the teaching in the school she attended. Glover emigrated to Tasmania in 1829 and there successfully continued his painting career, as well as developing his land grant. See Bernard Smith, “Glover, John (1767–1849),” in *Australian Dictionary of Biography*, vol. 1 (1966), 455–56.

36. *Tasmanian Journal of Natural Science, Agriculture, Statistics, &c.* 2 (1843): opp. 155.

37. Michael Hoare, "Botany and society in eastern Australia," in *People and Plants in Australia*, 183–219, especially 196–200.

38. Mary Allport played the harp, and she was a member of the Tasmanian Archery Club.

39. Allport's journals are held in the Archives Office of Tasmania, Hobart. See also Joanna Richardson, "An Annotated Edition of the Journals and Diaries of Mary Morton Allport," 2 vols., doctoral thesis, University of Tasmania, 2006.

40. Sally O'Neill, "Meredith, Louisa Ann [sic] (1812–1895)," in *Australian Dictionary of Biography*, vol. 5 (1974), 239–40; Elizabeth Lawson, "Louisa Anne Meredith (1812–1895)," in *Oxford Dictionary of National Biography*, online ed. (2004), www.oxforddnb.com.www2.lib.ku.edu:2048/view/article/61563 (Nov. 2008); Vivienne Rae Ellis, "Louisa Anne Meredith: A conservationist to her 19th century bootlaces," *Habitat* (Carlton, Australia) 2, no. 1 (1974): 9–12; David C. Miller, "Mrs. Louisa Anne Meredith and her colour printed books," *Antiquarian Book Monthly Review* 14 (1987): 88–95; Walter W. Froggatt, F.L.S., "One of our first bush naturalists," *Australian Naturalist* 5, no. 2 (1924): 182–84; J. H. Maiden, F.L.S., "Meredith, Louisa Ann [sic] (née Twamley), (1812– ----)," *Papers and Proceedings of the Royal Society of Tasmania* (1909): 21–22; Anon., "Louisa Meredith," website of the educational organization Australian Workers Heritage Centre, Barcaldine, Queensland, www.australianworkersheritagecentre.com.au/10_pdf/meredith.pdf (April 2009); Wilfred Blunt with William T. Stearn, *The Art of Botanical Illustration* (London: Collins, 1950), 220 and opp. 225; Judith Johnston, "'Woman's Testimony': imperial discourse in the professional colonial travel writing of Louisa Anne Meredith and Catharine Parr Traill," *Australian and New Zealand Studies in Canada* 11 (1994): 34–55 (an essay in literary criticism written from a feminist viewpoint; it adds little to the understanding of the contributions of colonial women writers and artists to nineteenth-century botanical science); Jordan, "Progress versus the picturesque," 341–57; Patricia Grimshaw, "Female lives and the tradition of nation-making," *Voices* (Canberra) 5, no. 3 (1995): 30–44; Kerr, "Mary Morton Allport."

41. Louisa Twamley's early publications were the following: *Poems, with illustrations drawn and etched by the authoress* (London: Charles Tilt, 1835); *The Romance of Nature, or, the flower-seasons illustrated* (London: Charles Tilt, 1836); *Flora's Gems, or, the treasures of the parterre: twelve bouquets drawn and coloured from nature*, illustrator James Andrews (London: Charles Tilt, 1837); *Our Wild Flowers, familiarly described and illustrated* (London: n.p. 1839, Tilt and Bogue, 1843); "Autumn ramble on the Wye," *Annual of British Landscape Scenery* (1839).

42. Blunt, *Art of Botanical Illustration*, 220.

43. See the section on botanist Elizabeth Kent in Creese, *Ladies in the Laboratory? American and British Women in Science, 1800–1900* (Lanham, Md.: Scarecrow Press, 1998), 33–34.

44. Louisa Anne Meredith, *Notes and Sketches of New South Wales during a Residence in that Colony from 1839 to 1844* (London: John Murray, 1844, and several later eds.).

45. Blunt, *Art of Botanical Illustration*, opp. 225.

46. Louisa Anne Meredith, *My Home in Tasmania during a Residence of Nine Years*, 2 vols. (London: John Murray, 1852; New York: Bunce and Brother, 1852), reprints Adelaide: James Dally, Sullivan's Cove limited editions, 1979, and Swansea, Tasmania: Glamorgan Bay Historical Society, 2003.

47. Francis Russell Nixon, the son of amateur painter Rev. Robert Nixon, was consecrated first bishop of Tasmania in 1843 and lived in the colony for the next nineteen years. A fine draftsman and a capable artist, he built up a collection of Tasmanian landscape drawings and paintings now in the Mitchell Library, State Library of New South Wales, Sydney; two albums of Bishop Nixon's photographs of Tasmanian Aboriginal people from the Oyster Cove region, "The last of the race," are in the David Scott Mitchell Australiana collections.

48. Louisa Anne Meredith, *Some of my Bush Friends in Tasmania; native flowers, berries and insects. First Series* (London: Day and Son, 1860); *Bush Friends in Tasmania: Last Series* (London: Macmillan, 1891). The latter includes a chromolithograph of her best-known animal painting, a work entitled *A Cool Debate*, showing a gathering of frogs.

49. Louisa Anne Meredith, *Over the Straits: A Visit to Victoria: with illustrations from photographs and the author's sketches* (London: Chapman and Hall, 1861), reprint Melbourne: State Library of Victoria, 1982; *Travels and Stories in our Gold Colonies* (London: Charles Griffin, 1865; London: Chapman and Hall, 1867), reprint Sydney: Mitchell Library, State Library of New South Wales, 1992.

50. Louisa Anne Meredith, *Our Island Home: A Tasmanian Sketch Book* (London: Marcus Ward, 1879; Hobart Town: J. Walch & Sons, 1879); *Tasmanian Friends and Foes, Feathered, Furred and Finned: a family chronicle of country life, natural history and veritable adventure* (London, Marcus Ward, 1880, 1881; Hobart Town: J. Walch & Sons, 1880, 1881).

51. Mrs. Meredith was probably referring to the distinguished English zoologist John Gould (1804–1881), who spent five months in Tasmania with his wife and son before moving on for a visit of about a year in New South

Wales and Victoria. Gould's publications included *Birds of Australia*, 7 vols., 600 plates, illustrators J. Gould and E. Gould (London: J. Gould, printed by R. & J. E. Taylor, 1840–1848), and later supplements. Most of the plates in the original seven volumes were lithographs prepared by Gould's wife, Elizabeth, from her own drawings. Elizabeth Gould is now recognized as an outstanding natural history artist (see A. H. Chisholm, "Gould, Elizabeth (1804–1841)," in *Australian Dictionary of Biography*, vol. 1 [1966], 465). John Gould also published *A Monograph of the Macropodidae, or Family of Kangaroos* (London: J. Gould, 1841–1842) and *The Mammals of Australia*, 3 vols. (London: J. Gould (Taylor and Francis), 1863, originally issued in 13 parts, 1845–1863).

52. Louisa Anne Meredith, *Phoebe's Mother: A Novel*, 2 vols. (London: Tinsley, 1870), first serialized as *Ebba* in the Melbourne weekly newspaper the *Australasian*, 1866–1867; *Nellie; Or, Seeking Goodly Pearls* (1882), reprint Boise, Idaho: Kessinger Pub., 2008; *Grandmamma's Verse-book for Young Australia. Part I* (Hobart Town: J. Walch & Sons, 1878, printed for the author by W. Fletcher, Orford, Tasmania).

53. *In Memoriam, the late Morton Allport, born December 4th, 1830, died September 10th, 1878* (Hobart?: n.p., 1878) reprinted from the Hobart Town daily newspaper *Mercury*.

54. Louisa Meredith went to especially great lengths to present to her British readers a picture of settler life in Tasmania as one of peaceful domesticity; the responsibility of the settlers for the brutal extermination of the Aborigines was a part of that picture that she omitted and in so doing denied. One strong reason for this may have been the fact that the entire pioneering Meredith family of Oyster Bay had been notorious in their treatment of the "natives." See Jordan, "Progress versus the picturesque," 354, and Grimshaw, "Female lives," 34.

55. Ronald McNicoll, "Kenyon, Alfred Stephen (1867–1943)," in *Australian Dictionary of Biography*, vol. 9 (1983), 572.

56. Alfred Kenyon, an engineer, is remembered especially for his work in extending the area irrigated by the Murray River and also for his pioneering studies on the ethnology of the Aboriginal peoples of Victoria. He was active in the Field Naturalists' Club of Victoria and the Royal Society of Victoria (see note 55).

57. Information from librarians Leonie Prevost, Sue McClarron, and Catherine Pearce, Launceston Reference Library, including an obituary from the *Launceston Weekly Courier*, 9 March 1911, 27, and death and funeral notices from the *Ulverstone Examiner*, 6 March 1911; remarks by Alexander Morton, secretary, Royal Society of Tasmania, at the 13 June meeting of the society, *Proceedings of the Royal Society of Tasmania* (1898–99): iv.

58. Gloria J. Moore, "A brief history of the Anglo-Indians," in *The Australian People: An Encyclopedia of the Nation, Its People and Their Origins* (1988), reprinted in *International Journal of Anglo-Indian Studies* 1, no. 1 (1996).

59. Walk about. Australian Travel Guide. "Ulverstone," <http://walkabout.com.au/locations/TASUlverstone.shtml> (Feb. 2005).

60. Mary Lodder's only brother, Ernest Lodder, a well-known civil engineer and land surveyor, was born in Cobham, Surrey, in 1857 and educated in England. Arriving in Melbourne in 1876, he worked on a number of engineering and surveying projects in Victoria and then in India before settling in Tasmania in 1892 (see *The Cyclopaedia of Tasmania*, 2 vols. (Hobart: Maitland and Krone, 1900), vol. 2, 266). An attempt was made to establish Mary Lodder's place and exact date of birth through Surrey History Centre, Woking, but without success. It would seem possible that the Lodder children were baptized in army chapels and so do not appear in county census lists for Surrey.

61. Penny Russell, "An improper education? Jane Griffin's pursuit of self-improvement and 'Truth', 1811–12," *History of Education* 33 (2004): 249–65, P. Russell, "Behold another Sheba comes," introduction, in Penny Russell, *This Errant Lady: Jane Franklin's Overland Journey to Port Philip and Sydney, 1839* (Canberra: National Library of Australia, 2002), 1–23, and P. Russell, *Displaced Loyalties: Vice-regal Women in Colonial Australia* (London: Sir Robert Menzies Centre for Australian Studies, Institute of Commonwealth Studies, University of London, 1999), 19; Hoare, "Botany and society," 195–97; Raymond Haynes, Roslynn Haynes, David Malin, and Richard McGee, *Explorers of the Southern Sky: A History of Australian Astronomy* (Cambridge, UK: Cambridge University Press, 1996), 69–70; Australian National Botanic Gardens, "Sir John and Lady Jane Franklin actively encouraged science and education in colonial Australia," www.anbg.gov.au/biography/franklin.biography.html; "Lenah Valley Museums Galleries," www.totaltravel.com.au/travel/tas/hobart/hobart/attractions/artgalleries/10111160 (April 2009 for both).

62. Hoare, "Botany and society," 190–201.

63. Hoare, "Botany and society."

64. Hoare, "Botany and society," 196–200.

65. Hoare, "Botany and society," 196.

66. Clive Lucas, "The architecture of Van Diemen's Land to 1856," in *Tasmanian Insights: Essays in Honour of Geoffrey Thomas Stilwell*, ed. Gillian Winter (Hobart: State Library of Tasmania, 1992), 132, 135 note 23.

67. Haynes et al., *Explorers of the Southern Sky*, 70.

68. Lady Franklin's letters and diaries remained unpublished during her lifetime but were brought out subsequently. See for instance diary excerpts edited by Penny Russell, such as her annotated *This Errant Lady* (note 61); Michael Organ, ed., *The Illawarra Diary of Lady Jane Franklin, 10–17 May, 1839* (Woonona, NSW: Illawarra Historical Publications, 1988); Willingham Franklin Rowsley, ed., *The Life, Diaries and Correspondence of Jane, Lady Franklin, 1792–1875* (London: Erskine Macdonald, 1923).

69. See note 61.

70. Creese, *Ladies in the Laboratory?* (1998), 288–94.

71. Ann Moyal, 'a bright & savage land': *Scientists in Colonial Australia* (Sydney: Collins, 1986), 127. See also the sketch in the New Zealand section of Agnes Bennett, who received a B.Sc. with honors in geology and biology from the University of Sydney in 1894.

72. For instance, amateur botanist Flora Campbell Martin (see above) collected fossil plants and woods in Victoria in the 1880s and 1890s.

73. Ursula Bygott, "Georgina King: Amateur geologist and anthropologist—1845–1932," *University of Sydney Archives Record* 9 (1982): 12–17; Jennifer M. T. Carter, "For the sake of all women," *National Library of Australia News* 13, no. 4 (Jan. 2003), reproduced at www.nla.gov.au/pub/nlanews/2003/jan03/article5.html (April 2009).

74. D. F. Branagan, "Georgina King: Geological prophet or lost?" *University of Sydney Archives Record* 9 (1982): 4–9.

75. Georgina King, "The Mineral Wealth of New South Wales and Other Lands and Countries," *Sunday Times* (Sydney), 1895, reprinted in 1896 and 1906 (with additions).

76. See Branagan, "Georgina King," 7.

77. Georgina King, "Diamonds and their origin," in King, *Antiquity of Aborigines . . . and Other Articles* (Sydney: Brooks, 1924), 24 pp., reprinted from *Sunday Times* (Sydney), December 1923, 20–24, on 24.

78. Carter, "For the sake of all women."

79. See for example, Georgina King, "The discovery of the 'Missing Link'—the appearance of woman as a 'sport' in nature, and the evolution of anthropoid man," *Science of Man and Journal of the Anthropological Society of Australia* 5, no. 11 (Dec. 1902).

80. Branagan, "Georgina King," 6.

81. See note 36.

82. Ragbir Bhatthal, "Women astronomers in Australia," *Astronomy and Geophysics* 42 (2001): 29–30.

83. "Reports of the Branches. New South Wales Branch (Sydney)," *Journal of the British Astronomical Association* 5 (1894–95): 243, 373.

84. *Journal of the British Astronomical Association* 7 (1896–97): 472; 8 (1897–98): 373. See also Wayne Orchiston, "Illuminating incidents in antipodean astronomy: Formation of the New South Wales branch of the British Astronomical Association," *Journal of the British Astronomical Association* 98, no. 2 (1988): 75–84.

85. See "The history of Alton: the historical and botanical significance of Alton," www.altongarden.com/history/history.htm (April 2009). For a further mention of the Mount Macedon region with its historic gardens see the section on flower painter Ellis Rowan (above).

86. Where not specifically referenced, information about these early women members of the Sydney and Melbourne branches of the British Astronomical Association came from the "Reports of the Branches" sections of the association's *Journal* for the period 1895–1905. The search of the *Journal* was not continued beyond 1905.

87. Mary T. Brück, "Mary Ackworth Evershed née Orr (1867–1949), solar physicist and Dante scholar," *Journal of Astronomical History and Heritage* 1, no. 1 (1998): 45–59, and "Evershed [née Orr], Mary Acworth (1867–1949), astronomer and literary scholar," in *Oxford Dictionary of National Biography*, vol. 18 (2004), 799–800.

88. Mary A. Orr, *An Easy Guide to the Southern Stars* (London and Edinburgh: Gall and Inglis, 1897, 2nd ed., 1911).

89. Mary A. Orr, "Variable stars of long period," *Journal of the British Astronomical Association* 15 (1904): 129–32.

90. Mary A. Evershed, "Some types of prominences associated with sunspots," *Monthly Notices of the Royal Astronomical Society* 73 (1913): 422–30; John E. Evershed and Mary A. Evershed, "Results of prominence observations," *Memoirs of Kodaikanal Observatory* 1, no. 2 (1917).

91. Mary A. Orr (Mrs. John Evershed), *Dante and the Early Astronomers* (London and Edinburgh: Gall and Inglis, 1914, revised ed. with preface by Dante scholar Barbara Reynolds, London: Allan Wingate, 1956).

92. Mrs. John Evershed, ed., *Who's Who in the Moon: notes on the names of all lunar formations adopted in 1935 by the International Astronomical Union*, *Memoirs of the British Astronomical Association* 34, Part 1 (1938).

93. Alison Mackinnon, *The New Women: Adelaide's Early Women Graduates* (Netley, South Australia: Wakefield Press, 1986), especially 31–35 and “Appendix: Women at the University of Adelaide 1874–1985,” comp. Susan Woodburn, archivist, University of Adelaide, 215–21. Additional information came from the University of Adelaide web page, “About the University,” www.adelaide.edu.au/uni (Nov. 2005), and from the Parliament of South Australia website, www.parliament.sa.gov.au/AboutParliament/History/TimelineorSouth-AustralianFirst/Politicalandsocialrightsforwomen.htm (April 2009).

94. Mackinnon, *New Women*, 31–35.

95. Adela Knight won a Sir Thomas Elder prize in physiology at the University of Adelaide in 1883 and was later accepted by the University of London. She is reported to have been the first Australian woman to graduate from the latter institution (Mackinnon, *New Women*, 21). Student registers and fee books at the Records Office of University College, London, confirm that Adela Knight studied chemistry there in 1885–1886 and analytical chemistry in 1886–1887.

96. See note 28.

97. Clifford Turney, Ursula M. L. Bygott, and Peter Chippendale, *Australia's First: A History of the University of Sydney, Vol. 1, 1850–1939* (Sydney: University of Sydney in association with Hale and Iremonger, 1991); Ursula Bygott and K. J. Cable, *Pioneer Women Graduates of the University of Sydney*. Sydney University Monographs, Number 1 (Sydney: University of Sydney, 1985).

98. M. Imelda Ryan [joint entry], “Brennan, Martin (1839–1912); Brennan, Sarah Octavia (1867–1928),” in *Australian Dictionary of Biography*, vol. 7 (1979), 403–4.

99. Open to all over the age of sixteen, this examination, modeled on a similar one at Oxford University, covered all the usual subjects included in a full secondary school course, as well as classical and modern languages. It was not intended for those seeking university entrance but provided official certification of a student's educational level (see Turney et al., *Australia's First*).

100. J. J. Fletcher, “Notes on Australian earthworms, Part 1,” *Proceedings of the Linnean Society of New South Wales* 1, no. 2 (1886): 523–74, on 554.

101. Martin Brennan, *Reminiscences of the Gold Fields and Elsewhere in New South Wales, Covering a Period of Forty-eight Years' Service as an Officer of Police* (Sydney: W. Brook, 1907).

102. R. W. Home, “Florence Martin (1867–1957),” in *Australian Dictionary of Biography*, vol. 10 (1990), 427; Elena Grainger, *Martin of Martin Place: A Biography of James Martin (1820–1886)* (Sydney: Alpha Books, 1970); “Obituaries. Florence Martin,” *Denver Post*, 31 October 1957, 68.

103. The Daniels and Fisher store, the source of this fortune, merged with another Denver retail business, the May Company, in 1958, becoming the May-D&F Department Store. The old Daniels and Fisher building was razed in 1971, but the adjacent Daniels and Fisher Tower, a Denver landmark, still stands; see www.coloradohistory.org/HSP/DFTower.html (April 2009).

104. Barbara Backmann and Elke Braderhahl, “Medizinstudium von Frauen in Bern, 1871–1914,” inaugural dissertation, Medical Faculty, University of Bern, 25 June 1990; notes in technical papers; New South Wales Registry of Births, Deaths and Marriages, www.bdm.nsw.gov.au/cgi-bin/Index/IndexingOrder.cgi/search?event=births (Oct. 2009); UK Census 1891, www.ancestry.co.uk/search/rectype/grouplist.aspx?group=1891uki (Oct. 2009); UK Census 1901, borough of Oxford, www.ancestry.co.uk/search/rectype/grouplist.aspx?group=1901uki (Oct. 2009); *The Medical Register* (London, General Council of Medical Education and Registration of the United Kingdom: 1903 p. 580, 1907 p. 615, and 1911 p. 533); *Kelly's Directory of Berkshire, Bucks and Oxon (with new map)*, 1903 (London, Kelly's Directories: 1903), pp. 208, 236, 276; *Kelly's Directory of Oxon 1907* (London, Kelly's Directories: 1907), pp. 268, 287; Bede Nairn, “Forster, William (1818–1882),” *Australian Dictionary of Biography* 4 (1972), 199–201; L. M. Geary, “Australian medical students in 19th century Scotland,” *Proceedings of the Royal College of Physicians Edinburgh* 26 (1996): 472–86.

105. Laura Forster's post-1900 publications include the following: “Note on foetal muscle spindles,” *Journal of Physiology* 28, no. 3 (1902): 201–2; “The histology of tuberculosis in the human lymphatic gland,” *Journal of Pathology and Bacteriology* 12 (1907–1908): 58–65; “Histological examination of the ovaries in mental disease,” *Proceedings of the Royal Society of Medicine* 10 (Section of Psychiatry) (1917): 65–87 (posthumous) and *Archives of Neurology and Pathology* 7 (1918): 1–23 (reprint). See also Sir Frederick Mott, “The psychopathology of puberty and adolescence,” *Journal of Mental Science* (London) 67, no. 278 (1921): 279–318, on 280.

106. See, for instance, William G. Spiller, “The neuromuscular bundles (Muskelknospen, Muskelspindeln, faisceaux neuro-musculaires),” *Journal of Nervous and Mental Disease* (Baltimore) 24 (October 1897): 626–30; T. Matsumoto, “A study of the relation between the reproductive organs and *Dementia Praecox*,” *British Journal of Psychiatry* 66, no. 275 (1920): 414–22, on 419.

107. Norman H. Olver and Geoffrey Blainey, *The University of Melbourne: a Centenary Portrait* (Carlton, Victoria: Melbourne University Press, 1956).

108. The University of Melbourne admitted (Julia) Bella Guerin (1858–1923) informally in 1874; she was awarded a B.A. (hons.) in 1883 and an M.A. in 1885; see National Pioneer Women’s Hall of Fame website, “Bachelor Girls: Women Pioneers in Australia’s Academic World,” www.pioneerwomen.com.au/bachelor.htm (April 2009).

109. University of Melbourne Archives; Student Records Office, University College London; B. K. de Garis, “Wilsmore, Norman Thomas Mortimer (1864–1940),” in *Australian Dictionary of Biography*, vol. 12 (1990), 517–18; Family Notices, Deaths, “Wilsmore,” *Argus* (Melbourne), 29 May 1945, 14.

110. *Victorian Naturalist* 10 (1893–1894): 38.

111. James Peter Hill (1873–1954), who was known especially for his research on the embryology of marsupials and monotremes, had a remarkable career. Born in Fife, Scotland, he entered the University of Edinburgh in 1889 and transferred a year later to the Royal College of Science, London. In 1892, while still in his teens and without completing his undergraduate degree, he was appointed to a demonstratorship in biology at the University of Sydney. Over the next five years (1892–1897), mainly in collaboration with J. T. Wilson, he published twelve papers on early development of marsupials and monotremes. Following a leave in 1897 to complete his degree requirements at the University of Edinburgh, he returned to Sydney and continued his embryology research. (He also published at least three papers in the *Australian Museum Memoir* series (1897 and 1899) on marine materials from the Funafuti expedition (see below). In 1906 Hill returned to Britain, having been named to the Jodrell professorship of zoology at University College, London; from 1921 he was professor of embryology there. Professor emeritus from 1938, he died in 1954. See J. P. Hill Collection, Site map, www.biology.duke.edu/kksmithlab/JPHill/hill_biography.htm, and University College London, AIM25 (Archives), Hill (James Peter) Papers, www.aim25.ac.uk/cgi-bin/vcdf/detail?coll_id=4034&inst_id=13 (April 2009 for both).

112. Leonora J. Wilsmore, “On some zoantheae from Queensland and the New Hebrides,” *Journal of the Linnean Society, Zoology* 30 (1909): 315–28 (plates 43–45); “On some Hexactiniae from New South Wales,” *Journal of the Linnean Society, Zoology* 32 (1911): 39–56 (plates 4–6).

113. Monica MacCallum, “Sweet, Georgina (1875–1946),” in *Australian Dictionary of Biography*, vol. 12 (1990), 149–50; Fay Anderson, “Georgina Sweet; a brilliant career,” *Australasian Science* 21, no. 4 (2000): 46; W. E. Agar, “Obituary: Dr. Georgina Sweet,” *Australian Journal of Science* 9 (1946): 15; P. C. M. “The late Dr. Georgina Sweet, OBE,” *Victorian Naturalist* 62 (1946): 211–12; “Sweet, Georgina (1875–1946), Biographical Entry,” in *Australian Women’s Archives Project*, National Foundation for Australian Women, 2002, www.womenaustralia.info/biogs/IMP0115b.htm (Jan. 2005); “A Sweet Example,” *WISNET Journal* 50, February 1999, www.wisnet-australia.org/issue50/sweet.htm (Jan. 2005).

114. The 1897 expedition to the coral atoll of Funafuti in the Ellice Islands group was initiated and led by Edgeworth David, professor of geology at the University of Sydney; its principal goal was the testing, by deep boring, of Charles Darwin’s theory that the growth of coral atolls depended on their being built on subsiding platforms. A considerable part of the expedition’s scientific and technical work was under the charge of Alfred Finckh, later resident pathologist at Sydney hospital but then a mature medical student with a background of published work on biological topics. Finckh succeeded in securing the cores, and he also carried out studies on the algae, corals, lime-coated protozoa, and starfish of the atoll, investigating the role each played in the reef’s growth and destruction. The expedition’s results added very significantly to knowledge of coral reef structure and biology; see Ernest S. Finckh and Andrew S. Finckh, “A riposte for a fencer,” published on the Internet by the *Medical Journal of Australia*, www.mja.com.au (Feb. 2005). Shortly after Edgeworth David presented the Funafuti report to the London Royal Society, he was admitted as a fellow, an honor he attributed in large part to the success of the expedition. See, *The Atoll of Funafuti: borings into a coral reef and the results, being the report of the Coral Reef Committee of the Royal Society* (London: Royal Society, 1904). This publication includes the following articles: A. E. Finckh, “Biology of the reef-forming organisms at Funafuti atoll,” Part VI, 125–50; T. W. E. David, G. H. Halligan, and A. E. Finckh, “Report on dredging at Funafuti,” Part VII, 151–59. For a popular account of the expedition’s three-month stay on Funafuti, based on her diary of daily life and her observations of the native people, see Caroline Martha David (Mrs. T. W. Edgeworth David), *Funafuti: or, Three Months on a Coral Island; an Unscientific Account of a Scientific Expedition* (London: John Murray, 1899), 318 pp.

115. Walter Baldwin Spencer, who was born in Lancashire and educated at Oxford, was appointed to the foundation chair of biology at the University of Melbourne in 1887. A well-known figure in Victorian scientific circles, he served as president of a number of the state’s scientific groups, including the Royal Society of Victoria and the Field Naturalists’ Club of Victoria. For many years he worked to support the establishment of national parks and to preserve the country’s native fauna. Although today his views about Australia’s native people would be considered racist and paternalistic, in the opinion of Europeans at the start of the twentieth century he was considered moderate; he held the position of Chief Protector of Aborigines, Northern Territory, in 1911–1912 and brought out an important report in 1913.

116. The university's MacBain Research Scholarship in Biology supports research in biology having reference to Australian flora and fauna. In memory of James MacBain, a former president of Victoria's Legislative Council, it is open to students enrolled in M.Sc. and doctoral programs, www.unimelb.edu.au/ExecServ/Statutes/r6014.html (April 2009).

117. See bibliography and also Georgina Sweet, "The anatomy of some Australian amphibia, Pt. 1," *Proceedings of the Royal Society of Victoria* 20 n.s. (1907): 222–49; "Variations in the anatomy of *Hyla aurea*," *Proceedings of the Royal Society of Victoria* 21 n.s. (1908): 349–64.

118. See bibliography for an initial joint paper with Spencer; the following publications are single-authored by Sweet: "The anatomy of *Notoryctes typhlops*. Pts. 1 and 2," *Proceedings of the Royal Society of Victoria* 17 n.s. (1904): 76–103; "The structure of the eye and associated parts in *Notoryctes typhlops*," *Transactions of the Australian Association* (1904): 307–10; "Contributions to our knowledge of *Notoryctes typhlops*, Stirling; Pt. 3. The eye," *Quarterly Journal of Microscopical Science* 50 s. 2 (1906): 547–71; "The skin, hair and reproductive organs of *Notoryctes*. Contributions to our knowledge of the anatomy of *Notoryctes typhlops*, Pts. 4 and 5," *Quarterly Journal of Microscopical Science* 51 s. 2 (1907): 325–44.

119. Georgina Sweet, "The eyes of *Chrysochloris hottentota* and *C. asiatica*," *Quarterly Journal of Microscopical Science* 53 s. 2 (1909): 527–37.

120. A substantial endowment given to the University of Melbourne in 1904 by David Syme, a Melbourne newspaper publisher, forms the foundation of this prize. It is awarded for the best original research in biology, physics, chemistry, or geology carried out in Australia during the preceding two years (excluding research by university professors). Preference is given to work having practical applications in the country's commerce and industry; see www.unimelb.edu.au/ExecServ/Statutes/r6017.htm (April 2009).

121. Sweet's publications on endoparasites include the following: Georgina Sweet, "The endoparasites of Australian stock and native fauna. Pt. 1. Introduction and census of forms recorded to date," *Proceedings of the Royal Society of Victoria* 21 n.s. (1908): 454–502; Georgina Sweet, "The endoparasites of Australian stock and native fauna. Pt. 2. New and unrecorded species," *Proceedings of the Royal Society of Victoria* 21 n.s. (1909): 503–27; J. A. Gilruth, Georgina Sweet and S. Dodd, "Notes on blood parasites," *Proceedings of the Royal Society of Victoria* 23 n.s. (1910): 231–41; J. A. Gilruth and Georgina Sweet, "*Onchocera gibsoni*: The cause of worm nodules in Australian cattle," with notes by J. Burton Cleland and T. Harvey Johnstone (Sydney: Commonwealth of Australia, 1911), 58 pp.; J. A. Gilruth and Georgina Sweet, "Further observations on *Onchocera gibsoni*, the cause of worm nodules in cattle," *Proceedings of the Royal Society of Victoria* 25 n.s. (1912): 23–30; Georgina Sweet, "Investigations into the occurrence of onchocerciasis in cattle and associated animals in countries other than Australia," *Proceedings of the Royal Society of Victoria* 28 n.s., Part 1 (1915): 1–51 (also, Melbourne: Minister of Trade and Customs, 1914); G. Sweet, H. R. Seddon, and W. A. N. Robertson, "Fluke in sheep," *Journal of the Department of Agriculture, Victoria* 15 (1917): 705–10; Georgina Sweet and A. C. D. Rivett, eds., *Report of the Fifteenth Meeting of the Australasian Association for the Advancement of Science: Hobart Meeting, held Melbourne, January 1921* (Sydney: The Association, Albert J. Mullett, govt. printer, 1921).

122. Jessie Stobo Watson Webb (1880–1944), a University of Melbourne graduate (B.A. 1902, M.A. 1904), taught in the university's history department from 1908 until her death in 1944. Appointed senior lecturer in 1923, she served as acting professor in 1925 and again in 1933–1934 and 1942–1944. Webb was a specialist in ancient history and archaeology and traveled extensively in the Near East and the Mediterranean region, especially Greece, where she spent periods at archaeological excavation sites; see www.unimelb.edu.au/150/150people/webb.html (April 2009).

123. Julie Marginson, "a'Beckett, Ada Mary (1872–1948)," in *Australian Dictionary of Biography*, vol. 7 (1979), 4–5; "a'Beckett, Ada Mary, née Lambert (1872–1948)," in *Bright Sparcs*, Australian Science and Technology Heritage Centre, 2002, www.asap.unimelb.edu.au/bsparcs/biogs/P000996b.htm (Feb. 2005).

124. See the section on the University of Adelaide, above.

125. In the 1890s the Annie Ruth Grice Scholarship was the University of Melbourne's most valuable prize; it paid college fees and university fees for two years. The Annie Ruth Grice Fund is now held by Janet Clarke Hall, a coeducational, Anglican residential college; see www.jch.unimelb.edu.au/jchataglance.php (April 2009). The Wyselaski Scholarships, established with funds bequeathed by John Dickson Wyselaski of Wickcliffe, Victoria, to the University of Melbourne, are available in six areas, including the sciences. Each scholarship is awarded annually by the university council, on the recommendation of the dean of the relevant faculty, to the student with the highest examination scores in the scholarship subject in a year of the course; see www.unimelb.edu.au/ExecServ/Statutes/r6007.html (April 2009).

126. See note 115.

127. Ada a'Beckett, *A Historical Sketch: The Growth and Development of the Free Kindergarten Movement in Victoria* (Melbourne: Free Kindergarten Union, 1939), 19 pp.; Ada a'Beckett, "Introduction," in *Pre-School*

Centres in Australia: Building, Equipment and Programme, ed. J. Cumpston and Christine Heinig (Canberra: Commonwealth of Australia, Department of Health, 1945).

128. The Lady Gowrie Children's Services were named after Her Excellency Lady Gowrie, wife of Alexander Hore-Ruthven, 1st Earl of Gowrie, governor-general of Australia from 1936 to 1944. When the Melbourne group's plan for establishing demonstration preschool education centers in each state capital was sent to Canberra, Lady Gowrie became particularly interested. Her enthusiasm and influence did much to promote the plan's quick acceptance. Lady Gowrie, née Zara Eileen Pollok (1879–1965), the daughter of John Pollok of Lismany, Galway, Ireland, was born on 20 January 1879. In 1908 she married Alexander Hore-Ruthven, Lord Gowrie (1872–1955), military secretary and aide-de-camp to the Lord Lieutenant of Ireland. Of her two sons, only one, Patrick, born in Quetta, India, in 1913, survived childhood; Patrick was killed in action in Libya in 1942. Lady Gowrie died in England on 19 July 1965; see Deirdre Morris and Chris Cuneen, "Gowrie, Zara Eileen (1879–1965)," in *Australian Dictionary of Biography*, vol. 9 (1983), 63–64.

Chapter Three

New Zealand

Kauri Pine Forests, Tree Ferns, Alpine Flowers, and Giant Seaweeds

Four pre-1901 scientific reports by women in New Zealand are listed in the Royal Society's *Catalogue*. Catherine Alexander and Elsie Low wrote on topics in botany, Josephine Rich coauthored a zoology paper, and Katherine Browning reported observations in physiology. The low number compared to that found for Australia (see above) to a significant extent reflects the fact that colleges and universities in New Zealand were concerned more with teaching than with research until well after 1900. It may also be noted that European settlement in New Zealand came somewhat later than in its neighbor to the northwest, although the earliest explorers had visited both these lands.

From the first European contact, New Zealand's plant life (also the subject to which women made their earliest contributions) was a matter of major interest. Thus, it is perhaps worthwhile to set the stage here with a brief mention of a few of the earliest explorers and the botanists who accompanied them.¹

In the course of circumnavigating New Zealand's two main islands (figures 3.1 and 3.2) during his *Endeavour* voyage (1768–1771), Lieutenant James Cook made short stops at a number of localities, giving the expedition's two botanists, Joseph Banks and Linnaeus's student Daniel Solander, opportunities to explore and collect fairly extensively. Among those who followed Cook was George Vancouver, who led a British naval expedition to the Pacific in 1791–1792. Vancouver spent three weeks exploring and surveying in Dusky Sound, at the southwest corner of New Zealand's South Island. With him was botanist and ship's doctor Archibald Menzies, a protégé of Joseph Banks, for whom Menzies collected a considerable quantity of new plants. Some three decades later the region was visited by Jules Dumont d'Urville, a plant collector and cryptogamic botanist, as well as an explorer. His two expeditions, the first on *La Coquille* and the second when he commanded the same ship, renamed *Astrolabe*, brought back impressive quantities of plants, as well as insect collections that enriched the holdings of the Paris Muséum national d'histoire naturelle;² d'Urville himself did much of the plant collecting, and the ship's surveyors produced new relief maps of parts of the South Island. Yet another notable event in the early history of botany in New Zealand was the visit of the 1839–1843 James Clark Ross expedition to reach the south magnetic pole. With Ross on the *Erebus* came the enthusiastic young botanist Joseph Hooker, who was later to succeed his father, William Hooker, as director of Kew Gardens. Joseph Hooker never lost his strong interest in the plants of New Zealand, an interest that eventually led to the publication of his classic *Handbook of New Zealand Flora* (1864–1867).

By the 1840s, following the formal recognition of New Zealand as a separate colony rather than part of New South Wales, the first permanent European settlers were arriving, most of them from Britain. Many came with the help of emigration societies, especially religious groups both Scottish Presbyterian and Anglican, occasionally assisted by the London government. The earliest organized settlements included Wellington, Wanganui, and New Plymouth in the North Island and Nelson, Dunedin, and Christchurch in the South Island.

As in South Africa and Australia, the first contributions by women to the development of scientific or science-related work in New Zealand were not such that they are included in the Royal Society's *Catalogue*. Nevertheless, the stories of eight of the early women contributors, plant explorers and

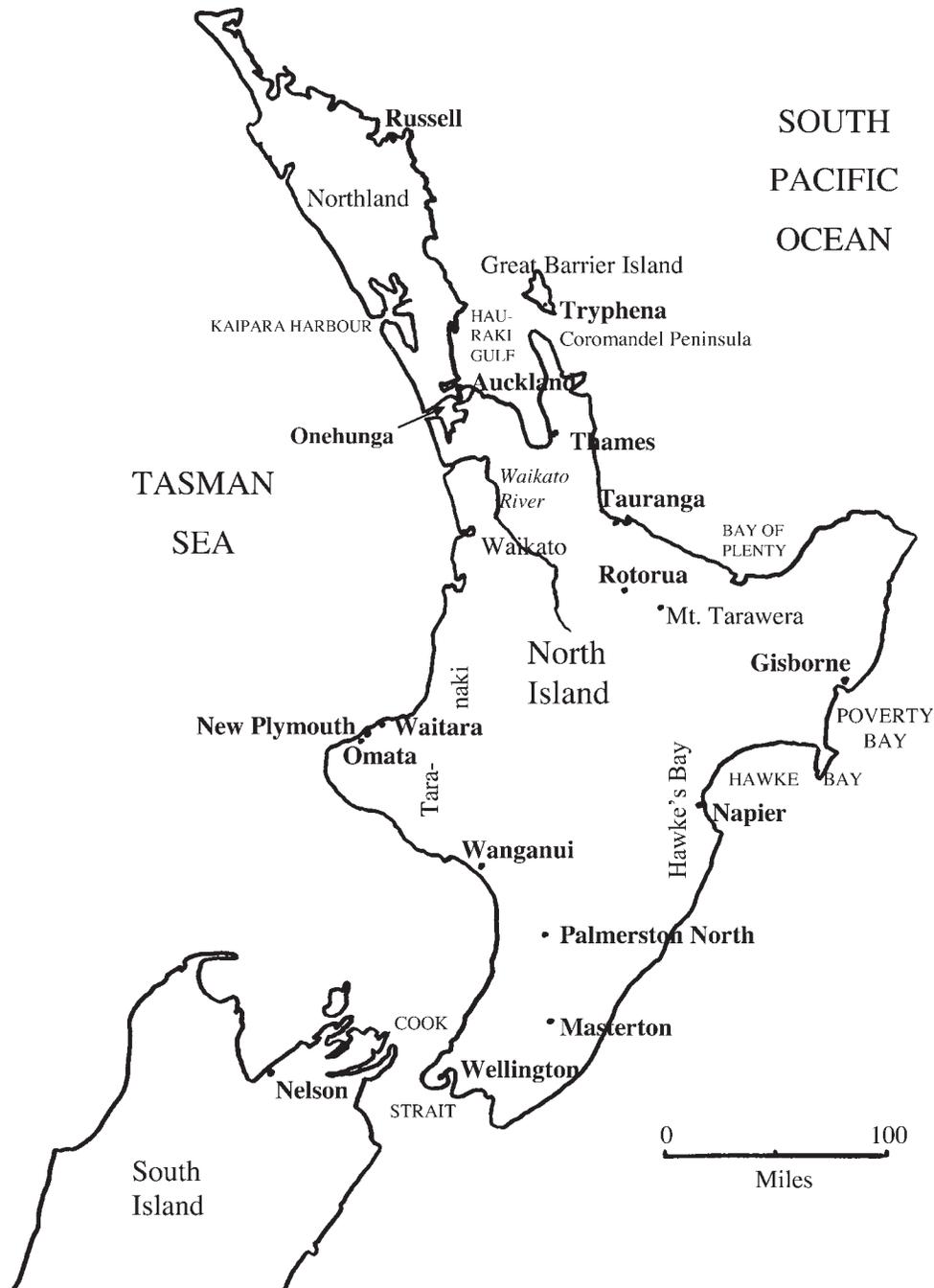


Figure 3.1. North Island, New Zealand.

botanical illustrators, are sketched here. New Zealand did not lack her early flower painters, many of whom were talented first-generation settlers inspired by the unfamiliar form and delicate beauty of their new country's flora.

INDEPENDENT CONTRIBUTORS

Early Botanical Artists and Two College-Trained Artists

Often described as New Zealand's "first resident botanical artist," MARTHA KING³ (1803?–1897) arrived at Wellington on the New Zealand Company's immigrant ship *London* in December 1840. Along



Figure 3.2. South Island, New Zealand.

with her were her older sister Maria and her brother Samuel Popham King. The daughter of a Protestant clergyman and his wife, née Popham, she was born in Ireland in 1802 or 1803. Her family belonged to a sect known as the Socinians, followers of two sixteenth-century Irish rationalist theologians, Laelius and Faustus Socinus, whose opinions resembled those of modern Unitarians. The sisters were well educated, and Martha most likely had artistic training; a biographer suggests that they may have been teachers or governesses before opting to take their chances in a new land and joining the large numbers of their countrymen emigrating at this period.⁴

The Kings had bought acreage from the New Zealand Company at Wanganui, about ninety-seven miles north of Wellington. Arriving there in February 1841 on the schooner *Elizabeth*, they joined the few Europeans already in this new settlement. Samuel quickly built two raupo houses—open, windowless

structures with walls made from the long leaves of raupo (bulrush) plants, in the style used by the Maori. One house was the family's living quarters, and the other served as a schoolroom in which the sisters opened the first dame-school in Wanganui. Samuel was immediately appointed to government office, becoming a justice of the peace from 1841, Wanganui's second postmaster in 1842, police magistrate in 1843, and the town's first harbormaster in 1844. Maria and Martha's school was well regarded and generally considered a great asset to the community. Since Martha, within a year of her arrival, undertook assignments in botanical illustration and also painted miniature portraits, most of the teaching was probably done by Maria. Both sisters wove New Zealand flax, producing cloth they sewed into bags and other fancy goods sold to supplement their income. Their food supply consisted of vegetables grown in their garden, greens collected in the surrounding woods, and whatever the Maoris were willing to barter in exchange for such things as tobacco and sewing implements.

Martha's skills as a botanical artist having become widely known soon after her arrival, the Wellington Horticultural and Botanical Society lost no time in commissioning her to prepare "two sets of drawings of the most interesting indigenous botanical specimens, and specimens of native woods"⁵—one set for the directors of the New Zealand Company and the other for the London Horticultural Society. Completed in January 1843, the set of forty drawings for the New Zealand Company arrived in London eight months later. Four of the originals were used in Edward Wakefield's *Illustrations to Adventure in New Zealand* (1845).⁶ Later placed in the collection of the Royal Commonwealth Society, the paintings were returned to New Zealand in 1981.⁷ No trace of the second set, intended for the London Horticultural Society, has yet been found.

The gradually increasing encroachment of Europeans on what had previously been Maori territory inevitably brought conflict between the two groups and disruption to the lives of the Wanganui settlers. When troops were sent to the region to keep the peace, a dispute over authority between police magistrate Samuel King and the force commander led to the King family's leaving Wanganui in 1847. They resettled in New Plymouth, about seventy-five miles northwest along the coast in the Taranaki region (figure 3.1), where Samuel King again took up government appointments and the sisters opened another school, soon to be considered the best in the community. In 1848 Samuel married Mary Jane Sullivan, a good musician, who joined her sisters-in-law in their teaching; music lessons were a popular addition to the school curriculum.

The King women quickly became prominent in New Plymouth society. Very sociable and energetic, they were remembered especially for the balls they organized in their school. Martha's interests were wide; as well as painting and teaching, she put much time and great effort into developing a fine garden. When land disputes between the settlers and the Maori flared into open warfare in 1860, New Plymouth was at the center of the fighting; Martha, to her great distress, had to abandon her garden and move to the relative safety of Auckland. However, the First Taranaki War, as it is termed, was short-lived, and when the fighting died down the family returned to New Plymouth. Mary King resumed her piano tuition, but Martha gave up teaching in 1862 when she was about sixty. She may have continued her painting, but much of her time was spent gardening, taking care of her poultry, and raising pigs.

As an artist she was well known locally, although she exhibited only once, when she sent a botanical study to the 1879 Sydney International Exhibition. Her watercolors were scientifically accurate, clean and uncluttered; they combined "a graceful and balanced composition with the direct and accurate observation of the flora of a new land."⁸ Her serious interest in New Zealand plants and the considerable store of information she had acquired about them enabled her to choose her specimens well and record them appropriately. Despite her frontier life, she was not without artist friends. At least one, Emma Wicksteed, lived in New Plymouth. Mrs. Wicksteed, the wife of John Wicksteed,⁹ was a teacher and artist, known for her panoramic views of the town. She too contributed to Edward Wakefield's book.¹⁰ There were also younger women flower painters in the region, including Georgina Hetley and Emily Harris (see below).

Martha King's surviving works are not many, comprising only the set of forty watercolors plus sixteen pencil sketches of scenes at Wellington, Wanganui, and New Plymouth dated 1841–1859. She herself was largely forgotten until the early 1980s, when the return of the originals of her forty

botanical watercolors to Wellington aroused interest in the unknown painter. She is now widely recognized as one of New Zealand's important nineteenth-century botanical artists who set high standards for those who came after. All her known extant work is held in the Alexander Turnbull Library, Wellington. She died in New Plymouth on 31 May 1897 at the age of ninety-four, having outlived her brother, sister, and sister-in-law. She left her cherished garden to the New Plymouth Recreation Grounds Board.

Botanical and landscape artist EMILY CUMMING HARRIS¹¹ (1837?–1925) spent most of her adult life in Nelson in the South Island, but she too had close connections with New Plymouth and the Taranaki region. Her works vary considerably in quality and style; some lack the fine details of leaf and flower structure, but many others are excellent examples of botanical illustration, carefully detailed and painted in vivid, accurate color. Despite somewhat precarious health, a lifelong struggle against poverty, and her depression over lack of recognition, she is generally considered a successful artist in colonial terms.

Emily Harris was born in Plymouth, England, on 28 March 1836 or 1837, the second of five children in the family of Edwin Harris (c. 1810–1895) and his wife, Sarah, née Hill. A civil engineer and surveyor, Edwin Harris was also a competent amateur artist. The family, in which there were then three children, left England in November 1840 on the 311-ton bark *William Bryan*, the first immigrant ship of the Plymouth Company (soon to be absorbed by the New Zealand Company¹²) to sail to New Zealand. Each immigrant had been promised a free section of land in New Plymouth. Conditions for the Harris family were very difficult for a time. Their raupo-and-log hut burned down about two months after they arrived, destroying most of their possessions, and food was in short supply. Edwin Harris had a post as surveyor for the Plymouth Company for eighteen months and also continued his art hobby; his wife started an elementary school.

Little is known about Emily's childhood in New Plymouth, but she and her siblings most likely attended their mother's school. As soon as she was old enough, she became an assistant in a second school her mother opened. Her interest in flower painting developed early, fostered by instruction in the rudiments of sketching and painting that Edwin Harris gave all his daughters; the surrounding countryside with its wealth of plant life would have provided plenty of inspiration.

As already noted in the sketch of Martha King above, in 1860 the disputes between Maoris and settlers in the region flared into open warfare. New Plymouth was at the center of the fighting, and civilian volunteers joined troops sent to quell the disturbance. Emily was then about twenty-six. Her older brother Hugh was killed at the Waitara camp just north of New Plymouth, and the Harris family, like many others in the region, abandoned their house and land. Emily's parents and her sisters moved to the town of Nelson, on the north coast of the South Island, where Edwin Harris found positions as art teacher, first at Nelson College and then in the Bishop of Nelson's School. Emily herself, the most artistically talented of the Harris women, spent several years studying drawing in Hobart and Melbourne before rejoining her family.

In Nelson she and her younger sisters Frances and Ellen ran a small private school and gave tuition in music, dancing, and drawing, but their earnings were less than adequate to cover their household expenses. The demand for their services was very limited; sometimes they taught children without recompense when parents had no money to pay. Despite persistent financial troubles, the Harris family was prominent and popular in the community. The sisters had a wide circle of friends and enthusiastically took part in the various recreational activities of the seasons, such as summer camping expeditions, picnics, balls, and garden parties. Health difficulties were a constant concern; Ellen was often ill, and Emily, according to notes in the diary she kept between 1885 and 1890, continually worried about her own health, including her eyesight.

Finding time for painting was always difficult for Emily Harris, with so many household tasks intervening. Nevertheless, especially during the 1880s, she experimented with a variety of artistic techniques. Her landscapes and botanical studies were usually in watercolors or oils, and she produced a number of paintings on satin, most of which were mounted and surrounded with fretwork, for use as fire screens. Her output included tabletops, mantel drapes, and small cards. Skill and competence she undoubtedly had. Her difficulty was the lack of local demand for her work, and her very logical

response was to try to expand her range of recognition by exhibiting at colonial and imperial exhibitions. At both the Melbourne International Exhibition in 1880 and the Wellington Industrial Exhibition in 1885 her entries were well received but resulted in little financial benefit. At Wellington she exhibited two screens, one four-fold and one three-fold, a small table screen depicting spring flowers, a fan, a mantel drape, and a small tabletop, but the strain involved in getting her pieces shipped and the anxiety she felt while waiting for the results were very considerable. She was much cheered by receiving a first prize for the large screen and a third for the tabletop. Exhibits not sold were packed and sent on to the 1886 Colonial and Indian Exhibition in London, where they received favorable notice but again no widespread recognition that might have brought significant reward.

With moderate successes at two overseas exhibitions doing little to increase sales or bring more pupils to the sisters' school, Emily decided to hold a local exhibition of the artwork of the whole family, her father and her sisters all being creditable artists. This went well; the money raised was enough to pay the household debts, and Emily was encouraged to arrange a number of subsequent exhibitions. One in New Plymouth in 1890 aroused little interest and resulted in few sales, but a second in Nelson the same year went well.

The family's money troubles continued, however, most likely becoming even greater after Edwin Harris was finally retired from his school teaching post in 1889 when he was about eighty-three. Emily's next effort to earn money was to have some of her botanical paintings published in book form. Nelson bookseller and stationer H. D. Jackson agreed to share costs in return for part of the profits. Three small books were brought out in 1890: *New Zealand Flowers*, *New Zealand Ferns*, and *New Zealand Berries*.¹³ Each comprised twelve lithographs, some of which were hand-colored; scientific and Maori or popular names of each plant were provided, plus a sentence or two about the plant and its distribution, but there was no further descriptive text. The drawings were well composed and accurate, although they lacked fine detail. Over the next several years Emily completed an additional collection, consisting of twenty-nine pen, ink, and watercolor studies of New Zealand alpine plants. The originals are outstanding examples of botanical illustration, finely detailed and vividly and accurately colored, with the plants shown in their natural environments; each illustration is accompanied by a brief text giving information about the plants and their distribution. The collection was never published, but in 1970 the originals, then in London, were bought by the Alexander Turnbull Library, Wellington.

Perhaps because of the appearance about the same time of illustrated works on New Zealand flora by two other resident women artists, Sarah Featon and Georgina Hetley (see below), sales of Emily Harris's three books were disappointing. Her only other published works were the illustrations she prepared for *Fairyland in New Zealand*, an adventure story for children by Mrs. Ambrose E. Moore;¹⁴ drawn to match Mrs. Moore's text, these illustrations were in the ornate, decorative style of the Victorian era that was soon to be replaced by the more true-to-nature art of the twentieth century.

Emily stayed on in the family home in Nelson throughout her last years, alone after the relatively early deaths of her younger sisters. She continued to paint in her constant struggle to earn a living through art; one might wonder whether, given more favorable circumstances, her talents might have developed more fully and her work been recognized more widely. In 1924 she had the satisfaction of having sixty-three of her watercolors purchased by the Alexander Turnbull Library in Wellington for ten shillings each. Two different sets of prints from this collection were issued in limited editions in 1968 and 1979.¹⁵ She died in Nelson on 5 August 1925 when she was about eighty-eight.

A third notable early botanical artist from the Taranaki was GEORGINA BURNE HETLEY,¹⁶ née MCKELLAR (1832–1898). Compared to both King and Harris, Hetley had relative financial security and freedom from the constraints of family obligations. This liberty was crucial, since it allowed her to move around and form broader social connections with the botanical community, which led to the further development of her considerable native talent and the fulfilling of her artistic ambitions. She and her fellow botanical artist Sarah Featon (see below) are perhaps the two most widely recognized women plant illustrators of late nineteenth-century New Zealand. Both produced notable collections that won special distinctions in their time and remain of interest and value.

Georgina was born in Battersea, London, on 27 May 1832, the second daughter among ten children of Dugald McKellar, a doctor, and his wife, Annette, née Clarke. The family moved to Madeira in

about 1842 for the sake of Dugald McKellar's health, and they remained on the island until he died ten years later. In the hope of finding better opportunities, Annette and her children, some of whom were already in their twenties, joined the wave of British emigrants going to New Zealand. Accompanied by two servants, they left Madeira in August 1852 on the *St. Michael*, arriving in New Plymouth the following December. They settled at Omata, about five miles south of New Plymouth, where they bought fifty acres of land they named Fernlea. The Taranaki's rich volcanic soil, regular rainfall, and good climate made ideal conditions for farming once the bush was cleared. The McKellar sons were evidently capable young men; their farm prospered, and the family was much respected in the settler community.

No details about Georgina's early education, or that of her siblings, appear to have been recorded in readily available sources, but she probably had at least basic instruction in drawing and painting, along with the other subjects considered desirable in the education of middle-class English girls at the time. In 1856, when she was twenty-four, she married a neighboring farmer settler, Charles Hetley, who had arrived at New Plymouth from England a year after the McKellars. Hetley came from a reasonably affluent background; his brother, a doctor, lived at Norbury Lodge, Upper Norwood, now within the southern limits of London. A year after the marriage, Charles Hetley died suddenly of a stroke, leaving Georgina with the farm, called Brookwood, and an infant son, Charles Frederick. About two years later she sold Brookwood and with her son returned to her family at Fernlea.

When the land disputes between Maoris and settlers changed to open warfare in 1860, the Omata region was very much involved; more-isolated farms were especially vulnerable to raiding parties. Consequently, Annette McKellar and her daughters moved to New Plymouth in early 1860. Her sons remained on their farm, joining the local militia to defend the district and man the Omata stockade. A number of skirmishes and bigger battles followed, British Army troops as well as militia being involved. New Plymouth, overcrowded with refugee settlers and increasingly threatened by disease, was essentially under siege. By the time a truce had been arranged in mid-1861, some two hundred farms in the Taranaki had been destroyed, and losses were reaching two hundred thousand pounds. The McKellar farm was among those totally devastated, fighting having taken place nearby, but the family returned and rebuilt. Despite the very great economic and social costs of the war, the settler population, by then both numerous enough and resilient enough, was able to begin recovering almost immediately.¹⁷

From the time of her arrival in New Zealand as a young woman of twenty, Georgina Hetley had been much impressed by the beauty of the Taranaki forest with its flowers and ferns; later she wrote of how she deplored its loss before the tide of cultivation. Her first New Zealand drawings were pencil sketches made around her immediate neighborhood—Fernlea, Brookwood, and, during the war year, New Plymouth. In 1863, during the lull in the Maori-settler conflicts after the first of the Taranaki wars, she and her six-year-old son traveled north to Waikato and then on to Auckland, Georgina painting local scenes in watercolor; a few years later she made a trip to Australia and sketched around stations in Queensland. By the late 1870s she had settled in Auckland and joined the Auckland artist community. Her first exhibit came in 1879 with the Auckland Society of Arts, and within a year or two she was winning prizes, one for an original design for embroidered drapes and another for a study of foliage. In 1883 she joined the New Zealand Art Students' Association, recently founded in Auckland. The aim of this group was to develop an art style distinctive of New Zealand, reflecting the natural beauty of the islands, an aim that she most certainly adopted with purpose and enthusiasm.

From about that time she concentrated particularly on studies of New Zealand native flora, especially the ferns and flowers. She was then in her early fifties and her son Charles a young man in his mid-twenties, presumably independent. Although hardly wealthy, she was evidently not without some means of support. In 1884 and 1885 she won prizes for studies of wildflowers, including a first prize at the 1885 New Zealand Industrial Exhibition in Wellington. The country's unique and spectacular ferns were a continuing interest; she made many drawings of the different varieties, built up a fine collection of pressed ferns, and for seven years worked with the Melanesian mission to prepare pressed sets for their fund-raising activities.

The work for which Georgina Hetley is best remembered is her book of forty-five paintings of native plants, published in London in 1888. The initial inspiration for making these paintings came from

a lecture she heard in Auckland in 1881. The speaker was Thomas Frederick Cheeseman, one of New Zealand's outstanding early botanists and curator of the highly regarded Auckland Museum, who had a strong interest in native wildflowers.¹⁸ Cheeseman, just returned from a botanical expedition to the South Island, showed a variety of dried specimens from the Nelson region. Georgina tried painting some of these flowers and three years later contacted Cheeseman at the museum to verify the names. Impressed by her talent and her obvious enthusiasm, he showed her more specimens, which immediately aroused her desire to paint as many different varieties of New Zealand wildflowers as she could, provided she could get some government help for the project. This came in the form of free rail travel and a commitment to purchase copies of her book for public schools and libraries. Additional support was provided by the Union Steam Ship Company, which gave her free passage on its steamers.

Between 1884 and 1886 she traveled throughout the length and breadth of New Zealand, an experience she enjoyed tremendously; the varying scenery and unfamiliar vegetation offered unending interest and pleasure. Starting in the Auckland region, she went on to other parts of the North Island, including the Taranaki, where the illegal forest burning then going on distressed her considerably. In all she made 125 paintings of North Island flowers before moving to Nelson and Greymouth in January 1886.

Travel was more of a challenge in the South Island, with its narrow roads over precipitous mountain ranges and through dangerous gorges. River crossings could be difficult, and occasionally there were also forest fires to contend with. For much of the time coach was the only means of transportation, but at that stage of her venture Georgina had the help and company of her niece. Ferns, mosses, flowers, and tall trees all were subjects of interest; near Otira Gorge and Arthur's Pass (figure 3.2) she collected alpine plants. Since she could paint only a few plants at a time, others were pressed, packed in tins, and taken to Christchurch, where she spent six weeks painting these specimens and also plants from Stewart Island and the Chatham Islands that were growing in the native garden in Christchurch Botanical Gardens. During a two-day visit to Dunedin she met surveyor, botanical artist, and former government botanist John Buchanan, who contributed two paintings to her book, illustrations of specimens Georgina herself had been unable to get. Buchanan considered her work particularly valuable because he too was painfully aware of the loss of native flowers and plants to burning and cultivation.

After a brief stop in Auckland, Georgina left for London to find a publisher, spurred on by the knowledge that her friends Sarah and Edward Featon were preparing their *Art Album of New Zealand Flora* for publication in Wellington. Her trip coincided with the important Colonial and Indian Exhibition, where she showed a number of watercolors. On the recommendation of her friend T. F. Cheeseman, Sir Joseph Hooker invited her to work at Kew Gardens, where she wrote descriptions, made dissections, and improved her skills in botanical drawing. Thanks to this additional experience, she was able to include in her *Native Flowers of New Zealand* dissections of most of the forty-five species reproduced in the book's thirty-six color plates. Although she enjoyed working at Kew and would gladly have continued longer, she found life during the English winter very difficult. A move to Madeira, well known from her ten-year stay there as a child, resolved the difficulty, giving her a congenial place in which to wait until the arrival of her page proofs while also providing an opportunity to paint a number of the island's distinctive tropical plants. She left for home in 1889, visiting Paris and Genoa before sailing for Sydney and Auckland. Her paintings of New South Wales flowers were well received in Australia.

Throughout the process of publishing, Georgina had help from both her brother Henry, who was secretary and inspector of customs, New Zealand, and from her brother-in-law, Dr. Hetley of Upper Norwood. The book appeared first in three parts and then as a single volume.¹⁹ Beautifully and lavishly bound in soft leather, at three pounds, thirteen shillings, six pence per copy it was expensive by late nineteenth-century New Zealand standards. Nearly all the five hundred copies printed were sold, but production costs wiped out any profit.

Since *Native Flowers of New Zealand* came out at almost the same time as Sarah and Edward Featon's *Art Album*, the two books are often compared.²⁰ Some critics consider Hetley the better artist; plants in a few of her paintings perhaps have a more natural appearance, but the general styles of the

two were similar. Although the thirty-six chromolithographs in *Native Flowers* may seem crude by twenty-first-century standards,²¹ the book, planned as a somewhat decorative popular work, succeeded in its aim of bringing the New Zealand native flora to the attention of the public. One of the illustrations is still considered a valuable record by professional botanists—that of *Loranthus adamsii*, a native New Zealand mistletoe first collected extensively near Thames in 1880 and now presumed extinct.²² Each painting is accompanied by a short text giving Latin name, Maori name if known, and a simple description of the plant or tree detailing characteristics of leaves and flowers; flowering time and medicinal properties are also noted. Georgina's eight-page introduction, with its informative descriptions of her travels throughout New Zealand between 1886 and 1888, very clearly shows the tremendous enjoyment she found in the work:

It was a serious undertaking, for I had to travel by sea and land, coaching over rough and dangerous roads, and at great expense, risk and fatigue. But it was a labour of love. Every new flower was a delight and wonder; and the scenery, which I might otherwise never have seen, and the delightful excursions with kind friends to help me get flowers for "The Book" was enough to repay all my fatigue.²³

The work brought her international recognition; a French edition was compiled specially for the Paris Exhibition of 1889 and came out that year.²⁴ Coauthor of this somewhat expanded edition was Édouard François Armand Raoul, nephew of Étienne Raoul, botanist and surgeon on the *Aubé* during an 1840 French expedition to the Banks Peninsula; Étienne Raoul was the first to explore extensively in the Southern Alps.²⁵ Georgina met Édouard Raoul in 1886 when he spent almost a year in New Zealand in the course of a round-the-world scientific expedition sent out by the French government; his particular interest was the identification of commercially important plants and trees suitable for introduction to French overseas territories. Raoul saw the work Georgina was then doing for her book, and he suggested a French edition, expanded by a section on sixteen New Zealand trees, almost all of economic importance; examples included kauri (*Agathis australis*), rimu (*Dacrydium cupressinum*), and red beech (*Nothofagus fusca*). Accompanying descriptions contained such technical information as wood density and tensile strength. Georgina's lengthy, conversational-style introduction to the English edition was replaced by the French editors with a more formal general preface.

Both the colored illustrations in the book and the timber samples brought from New Zealand by Raoul aroused considerable interest and admiration among visitors at the exhibition. Of the fifty copies of the French edition printed, thirty-five were distributed by Raoul to libraries and other public institutions; thirteen of those remaining were bought during the first week they were placed in the exhibition. High production costs prevented the publishers from bringing out a hoped-for second edition.

Included in the French edition was one chromolithograph additional to the original thirty-six, an illustration of the vegetable sheep *Raoulia eximia*, a member of the composite genus *Raoulia* named by William Hooker in honor of Étienne Raoul. The remarkable vegetable sheep grow on high shingle-slips in the Southern Alps, the plants forming huge hummocks up to six feet long by three feet across. The thick, woody main stems and strong roots pass into rock crevices below the slips and serve as anchors; many-branched stems are covered with small, woolly, tightly packed leaves at the extremities, the whole forming a dense, compact mass. Perhaps the most interesting attribute of the vegetable sheep is its ability to live on its own debris, the peat of water-retaining, rotten leaves and branches in the interior into which the outer branchlets send roots; it presents a striking example of ecological efficiency in one plant.²⁶

Georgina Hetley held two later exhibitions, one in Auckland and one in Wellington, her main purpose being to make the rarer New Zealand flowers more familiar to the general public. After a long illness she died at the age of sixty-six, on 29 August 1898, in Auckland, her usual place of residence since 1889; her son Charles survived her. One of New Zealand's early botanical enthusiasts, she was a forceful personality, single-minded in pursuit of her goal of painting New Zealand's native flora before it was irreparably damaged by the advance of cultivation. A number of her watercolors of New Zealand plants, as well as some of her paintings from Madeira and Australia, are held in the Alexander Turnbull Library, Wellington; various other institutions, including the Hawke's Bay Art Gallery and Museum, Napier, and the Auckland Institute and Museum, also own works by her.

SARAH ANN FEATON,²⁷ née PORTER (1848–1927), shared with Georgina Hetley the desire to bring to the general public the great richness, variety, and beauty of the native New Zealand flora. As already noted, the collections of botanical paintings that these two talented artists brought out in the late 1880s inevitably invite comparisons; each body of work was considered important by botanists, and both women were much respected by fellow artists. Both earned special distinctions, Hetley receiving international recognition and Featon having a collection of her paintings chosen as New Zealand's gift to Queen Victoria on the occasion of her diamond jubilee in 1897.

Sarah Ann Porter, the daughter of William Henry Porter, a gentleman of independent means, was born in 1848, probably in London. She was educated by an uncle who had a strong interest in art, and she may have received instruction in drawing and painting from him. Neither any details of her early life nor the date and circumstances of her arrival in New Zealand have yet been discovered, but in March 1870 in St. Paul's Church, Auckland, she married Edward Henry Featon (1840–1909), then a captain in the Auckland Militia. The fact that Edward Featon was his wife's full and essential partner in her botanical work amply warrants inclusion here of some details about his background and career.

Edward, his brother, John, and their parents John and Sarah A. Featon sailed from London on 7 October 1859 on the full-rigged ship *African*, arriving at Auckland on 30 January 1860; evidently not a wealthy family, they made this four-month voyage as steerage passengers.²⁸ They settled in Onehunga, now a pleasant Auckland suburb but then a poorer community, the main dock and shipping terminal opening to the Tasman Sea; the Onehunga docks were used by vessels coming from Britain via South Africa and Australia and also by steamers leaving for the South Island. Edward Featon was then a young man of nineteen. Within a short time of their arrival, both the Featon brothers, along with the rest of the able-bodied, unmarried, male population of Auckland between the ages of sixteen and forty, joined the Auckland Militia. Organized following the outbreak of hostilities between Maoris and settlers in the Waikato region (figure 3.1), this force, made up of many units, included the Onehunga Naval Volunteers, which John and Edward Featon joined as privates, John also taking on the work of war correspondent;²⁹ Edward served on one of the armored boats patrolling the Waikato River. A few years later, by then promoted to the rank of captain in an artillery unit, he took part in "Te Kooti's War," the fighting against the Maori leader Te Kooti Rikirangi, which was the final campaign in the New Zealand Wars.³⁰ Following his escape in 1868 from imprisonment on the Chatham Islands, Te Kooti, a fiery proponent of the powerful and influential religious cult known as the Hauhau,³¹ triggered a struggle between his Maori followers and the settlers. Fighting began in the relatively remote Poverty Bay region (figure 3.1), but the campaign was fast moving, and several localities in the north of the North Island were affected; Edward Featon's unit defended the settlement of Tauranga. Edward was also president of a committee of volunteer officers formed to report on the best plan of defense for the port of Auckland.

Soon after their marriage in 1870, Sarah and Edward Featon moved to Gisborne. Largely inaccessible by land, this Poverty Bay settlement of about five hundred Europeans was still a raw frontier town reached most readily by one of the east coast steamers. About the time the Featons arrived, the community was linked to the national telegraph system, and by 1879 it had a post office. Logging and sawmill operations were already important, but the rapid increase of the region's population that began in the early 1870s meant that the main business of the town was land distribution and purchase; surveyors and lawyers were much in demand. In 1874 Edward Featon joined the Lands and Survey Department as a draftsman at a salary of two hundred and fifty pounds per annum. The following year he was appointed Gisborne's first district lands officer. Matters of defense remained very much in the public mind; Gisborne area settlers still held painful memories of the 1868 fighting against Te Kooti and the resulting Poverty Bay massacre, in which about sixty settlers and Maoris were killed. In 1878 Captain Featon took a leading part in forming a local volunteer artillery unit, the "J" battery, one of a number of units that together made up the New Zealand Regiment of Volunteer Artillery; for a time he was the unit's instructor.³² Later he was awarded the New Zealand War Medal for his military services.

The Featons do not seem to have been particularly prominent among Gisborne residents; historian Bee Dawson suggests³³ that the preparation of their flora left them little spare time for community activities.³⁴ Perhaps the major event in this relatively isolated region during the years when the Featons were working on their book was the June 1886 volcanic eruption in the Tarawera Complex in the

mountainous region about eighty-five miles inland from Gisborne. A massive disturbance that lasted for four hours and scattered mud, ash, and scoria over more than six thousand square miles, it showered ash over the Poverty Bay region, made the sky dark, and cut the telegraph connection.³⁵

Edward Featon, most likely the dominant partner in the preparation of the *Art Album*, was a keen promoter of native plants for the home garden. His years of experience in the military, often in fairly untouched areas, may well have aroused or increased his botanical interests and given him a chance to closely observe the beauty and variety of the North Island flora in its natural settings. He kept in close touch with nurserymen in Auckland and Christchurch who were just beginning to cultivate and sell native plants, and he encouraged them to stock a wider range, offering suggestions of suitable varieties. In their many-year joint botanical undertaking, Sarah and he set out to produce a volume of flower pictures that would clearly demonstrate that the New Zealand flora, brought to the attention of Europeans at a relatively late date in the history of colonial expansion, included far more than forest trees and ferns. Edward would write the text and Sarah paint watercolor illustrations.

Wherever possible in their work, the Featons made use of Sir Joseph Hooker's *Handbook of New Zealand Flora* (1864–1867), which had been accepted as the standard reference on New Zealand flora for more than twenty years. However, Hooker's approach and his lack of illustrations and information concerning Maori names and uses meant that his work had never had much appeal for the amateur botanist; by the 1880s it was also out of date, many more species having been discovered since its publication. Edward followed Hooker's basic technical descriptions of characteristic features of plants and also Hooker's organizational plan for arranging the material into families and orders; distribution data were his own, as were his somewhat extravagant general descriptions, which seem old-fashioned by today's standards. He included information on Maori uses of plants taken from the many writings of his friend the naturalist and missionary William Colenso.³⁶ Both Colenso and his colleague the Rev. William Williams strongly supported the Featons' work. A keen general naturalist and a good botanist, Williams knew the Gisborne region well and helped Sarah to collect in the district. He was one of many botanical enthusiasts who, over the course of almost a decade, supplied her with specimens from all parts of New Zealand, including the Southern Alps and the Antarctic islands.³⁷

The Featons' *Art Album* was initially brought out in three parts between 1887 and 1888 and then as a single volume in 1889.³⁸ Two further volumes were planned but never published, although Sarah is thought to have completed most, if not all, of the paintings that were to be included; ninety-three of these are now in the Museum of New Zealand (Te Papa Tongarewa), Wellington. The book was the first fully colored artwork to be printed in New Zealand, making its appearance a landmark in the country's publishing history. The pictures were reproduced (as were those of Georgina Hetley) using the relatively new process of chromolithography, considered very good at the time. Most of Sarah's forty plates, including the frontispiece, illustrated a single species, but other plates, such as one of alpine plants, had several species on a page. Of the more than one hundred fifty flowering plants described, representing about seventy dicotyledonous genera, fifty-three were illustrated by Sarah. Contemporary critics were enthusiastic, later experts less so.³⁹ She tended to use very intense colors, to which little solvent had been added, making her flowers at times brighter than nature; in addition, some of her drawings were lacking in the finest details. But the illustrations are generally accurate, and the original watercolors indicate clearly that she had a fine delicacy of execution and a better eye for color than the somewhat crude chromolithographic plates suggest. Beautifully bound in either morocco or cloth, the *Art Album* was a worthy choice for New Zealand's gift to Queen Victoria on her diamond jubilee; along with some watercolors, it was presented in a small casket of New Zealand woods. It is now in the British Museum.

As was the case with Georgina Hetley's *Native Flowers*, production costs were extremely high and could not be recouped in sales, despite a substantial list of subscribers. The project is thought to have almost bankrupted the Wellington printing and publishing firm of Bock and Cousins, whose partnership dissolved soon after publication of the *Art Album*. It was also a considerable financial drain on the Featons; cost undoubtedly played a major role in preventing the publication of any additional volumes.

Edward Featon gave up his position in the Gisborne Survey Department in 1893 because of health difficulties but rejoined as a draftsman seven years later. He died in 1909 at age sixty-nine and was buried with full military honors. Sarah continued to paint, for the most part producing copies of her

original botanical studies. She had many friends in Gisborne and remained active and busy throughout her life; leaf pressing and building model Maori villages were some of the many crafts she enjoyed. Throughout her years as an elderly widow she was very short of money; by about 1920, when she was already over seventy, she reluctantly decided to sell her paintings. She wanted to keep the collection together, if possible in New Zealand, although she also contacted the Smithsonian Institution in the United States and the British Museum. The paintings are now in the Museum of New Zealand, Wellington, the government acquiring them at what Sarah ruefully considered a bargain price. She died in 1927 at the age of seventy-nine, having outlived Edward by eighteen years. Of the Featons' two children, only their son Edwin (Teddy) is thought to have survived childhood.⁴⁰ Little is known of him, except that he worked for the Hawke's Bay and East Coast stock and station firm Williams and Kettle. The plant *Dracophyllum featonium* was named by Colenso in Sarah's honor; it is now considered the same as *Dracophyllum strictum*.

FANNY OSBORNE,⁴¹ née MALCOLM (1852–1934), is an especially interesting figure—perhaps she might even be described as romantic—among the early botanical artists whose contributions are sketched here. She lived for most of her life on remote Great Barrier Island, the large, wooded, and very beautiful subtropical island about fifty-five miles northeast of Auckland across the sheltered waters of the Hauraki Gulf (figure 3.1); the setting alone gives an added charm to her story. Fanny's watercolors, outstanding examples of accurate, detailed botanical illustration that also convey the delicate beauty of her subjects, are now especially valuable as a historical record of the flora of Great Barrier Island in the opening years of the twentieth century. Her work has been compared more than favorably with that of both European and other New Zealand plant illustrators of the time, including Georgina Hetley and Sarah Featon.⁴²

Born in Auckland on 29 January 1852, she was the second of thirteen children of Neill Malcolm and his wife, Emilie. Neill Malcolm, son of a prominent family in the clan Malcolm of Argyll, western Scotland, was a barrister of the Inner Temple, London, but he abandoned his law career when he unexpectedly lost his inherited income because of rash speculation by a trustee. In 1848 he married Emilie Monson Wilton, the daughter of a retired British army colonel then living in the Thames valley in the south of England. Two years later the young Malcolms joined the wave of British emigrants moving to New Zealand; they arrived at the town of Auckland, whose population was then about four thousand, on the SS *Victory* in February 1851.

During the first seven years of Fanny's life, the family moved around as Neill Malcolm tried his hand at a succession of farming and business interests. None of these being successful, in 1859 he entered into a partnership with an English settler, Robert Barstow, who had established a cattle farm venture at Rosalie Bay at the southern end of Great Barrier Island. Barstow offered the Malcolms a cottage in return for help with the farm, but within three months of their arrival he returned to the North Island to take up a magistrate's position, leaving the Malcolms as the only European settlers at Rosalie Bay.⁴³

Great Barrier Island—Aotea, or White Cloud, to the Maoris—has a long history of human settlement. For close to five centuries before the arrival of James Cook in 1769 it had a sizable Maori population. Although a base for whaling ships was established in the late 1820s, the first Europeans to settle there came in the 1840s, attracted in large part by the island's timber wealth. Logging and sawmill operations were soon under way, making considerable inroads into the magnificent forests of giant kauri; the cleared land around the coastal areas was found good for farming. Shipbuilding and mining ventures started some decades later. When the Malcolms arrived in 1859, the island may well have been considered less remote than it seems today; the sea was then a major highway, and the island's inlets offered shelter to many small trading vessels.⁴⁴

Left at Rosalie Bay on a run-down farm with dilapidated buildings, broken fences, and cattle gone wild, the Malcolm family, which now included four small daughters, had to become essentially self-sufficient. After moving into a large, raupo dwelling somewhat in need of repair, they had more living space. Fortunately, Neill Malcolm, a fine athlete in his youth, was good at catching calves and pig hunting; the cattle that had "gone bush" were redomesticated, and a small herd of tame, hand-fed animals gradually was built up. The soil was rich, and the garden thrived. Emilie had nine more children—thirteen in all, although one died in infancy. She provided their schooling, including instruction in drawing. Although her own training in art was slight, she recognized the talent in her children

and provided them with good art materials brought from Auckland. All the children grew up very familiar with the island's plant life.

The indications are that, despite their isolation, the Malcolms lived fairly happy and satisfactory lives, while also keeping up with "civilization," so that the children could eventually fit into British society if they should ever so choose. Their one major difficulty was their inability to obtain an official title to their farm; being essentially squatters on Maori-owned land, their claim was tenuous. Repeated requests for a government survey and grant of title resulted in only a partial, never-completed survey. Consequently, the arrival in 1867 of twenty new settlers to take up government-allotted, forty-acre grants in the neighboring Tryphena area caused considerable trouble. The compromise reached reduced the Malcolm property to eighty acres, for which they had to pay a fee of fifty-six pounds, while the new settlers received their grants without charge. Further, the peace of the island was badly disrupted; much of the forest around the Malcolms' land was cleared, and cattle they considered theirs were hunted and killed. But since the wars were still going on in the North Island, staying at Rosalie Bay seemed better than returning to Auckland. By then the Malcolms had enlarged their original cottage, built up a good dairy and a poultry yard, started honey production, and established a fine garden; their investment of eight years of hard work had brought a good return.

The family declined all social interaction with the new settlers, Emilie Malcolm becoming especially embittered. Their nearest neighbor, Alfred Joe Osborne, was particularly resented, since the Osborne holding at Tryphena was land the Malcolms regarded as rightfully theirs. Osborne, the son of an Auckland wool merchant, came to Great Barrier to look after property acquired by his father. Born in Leeds, England, he was young, adventurous, hardworking, and well educated, with four years of study of music and languages in Brunswick, Germany, behind him. In 1874, to the consternation of her family, Fanny Malcolm and he eloped to Auckland on a trading schooner; they were married on 15 January that year by Bishop Cowie at Bishopscourt, in the Auckland suburb of Parnell.

Fanny was then twenty-one and Alfred Osborne twenty-six. They returned to Great Barrier and settled on the Osborne farm at Tryphena. Both sets of parents disapproved of the match, and Emilie Malcolm stubbornly kept her distance, cutting herself off from her daughter from then on. Fanny's life was very like her mother's, however—they even had the same number of children, Fanny having eight boys and five girls, the last born about 1896, when she was forty-four. Like the Malcolms, she and Alfred during their early years together were basically subsistence farmers, keeping a few cows, a productive vegetable garden, and a grove of mulberry trees. Honey production, a major source of income, later became their main livelihood. It was the kind of life she had known since childhood and for which, to that extent, she was better prepared than her middle-class English mother had been. Fanny's flower garden was particularly fine, with old plants and shrubs and long, shallow ponds built into the hillside by Alfred and filled with water lilies he imported. Her dairy under shady trees, where she set out her pans of milk for the cream to rise, was equally memorable, as was her butter making; she simply skimmed off the cream into a large jar and walked about the house shaking the jar until the butter formed.

In 1884 a school was opened in Tryphena, with Alfred Osborne as the first teacher; the twenty children who attended included several young Osbornes. This school was relatively short-lived, but there were others on the island; later Alfred taught his own children at home, and he also employed a tutor, Thomas Gibbard, to provide more-advanced instruction. An excellent carpenter, skilled and creative, Alfred especially liked making inlays with native timbers. He and his sons became very experienced house-builders and expert boatbuilders, producing small boats and launches to order. Since much of the North Island's communication was by sea, boat construction was an important business.

Alfred was also a keen naturalist. He supplied Auckland botanist T. F. Cheeseman with rare botanical specimens and collected seed for North Island nurserymen; the cultivar lacebark *Hoheria populnea* 'Osbornei' was named after him. His extensive knowledge of the island flora enabled him to give Fanny considerable help and encouragement when, probably by the late 1890s, she finally had time to take up painting; many of her subjects were specimens he collected for her. Although her daughters all enjoyed sketching, and the oldest, Lilian (who married Thomas Gibbard), later became a noted painter of English wildflowers, Fanny herself gave them little tuition; she liked to work alone. She had a critical eye for the structure of the freshly picked specimens she painted and was correct in detail, while also

capturing the soft beauty of each flower and leaf. Although not intended to be botanical illustrations, her paintings are in fact exceptionally fine examples of that category. In contrast to other well-known flower painters of the period, she did not have rare specimens brought to her from all over the country, and as a result her work provides a clear, undiluted record of the native flora of subtropical Great Barrier Island in the late nineteenth and early twentieth centuries. As such her paintings have considerable scientific value, outstanding examples being her three watercolors of the New Zealand mistletoe *Trilepidea adamsii* made between 1909 and 1920. The plant was never again recorded on Great Barrier Island and is now considered extinct.⁴⁵

Over the years her materials varied; initially she used whatever was available, but later she would probably have ordered best-quality paper, brushes, and watercolors from Auckland. She was very skilled at mixing her own colors, making sure that she had the exact shades she needed for accuracy; when her painting entitled *Native Berries of New Zealand* appeared as a colored illustration in *Brett's Christmas Annual* (1913), she may well have felt less than satisfied with the effect of the chromolithographic process on her carefully crafted shades.⁴⁶ Her pictures that have been stored out of the light have withstood well the test of time, but in others the colors have faded, or the paintings suffer from “foxing”—the development of brownish patches of discoloration on the old watercolor paper.

By the early 1900s she was producing “sets” of paintings of native flowers, each painting on eight-by-ten-inch paper. She painted some species several times, none of the paintings being the same. Her most creative period was probably between 1911 and 1916, when she was in her sixties and after her family responsibilities had lessened; she may have sold both sets and single works from her home. By the 1920s her paintings had become quite well known, sufficiently so to attract the attention of the governor-general's wife, Lady Alice Fergusson, herself a keen naturalist. Lady Alice twice visited Fanny, staying at Tryphena, sketching the Osborne home with its colorful garden, and buying a set of Fanny's flower paintings.

A widow from 1920 and severely crippled with arthritis toward the end of her life, Fanny stayed on at Tryphena until she was seventy-seven, when she reluctantly moved to the mainland. She spent her last four years in Auckland with two of her daughters, Constance and Winifred, dying there at the age of eighty-one on 12 March 1933. Burial was on the family farm on Great Barrier Island. The largest collection of her paintings is held at the Auckland Institute and Museum; donated by her daughter-in-law Mona Osborne in 1932, they were placed on permanent exhibition, a notable recognition of their merit and value.

The talents and creativity of Fanny and Alfred Osborne passed on in full measure to several of their children. Among the daughters, Lilian, the wildflower painter who married Thomas Gibbard and moved to England, won medals at Royal Horticultural Society exhibitions; Ellen and Winifred were also very good artists. Son Cedric learned the art of inlaying native woods from his father. Known nationally by the 1950s, Cedric was commissioned to make two inlaid panels of native flowers for a desk given to Princess Elizabeth and the Duke of Edinburgh as a wedding present from the people of New Zealand. Charles, a good naturalist who supplied unusual local plants to a New Plymouth nurseryman, was a keen conchologist; he kept a shell museum, open for summer visitors, where he also displayed flower paintings by his mother and sisters.

Margaret Stoddart and Isabel Hodgkins, the remaining two botanical artists considered in this selection, were South Island women, Stoddart being from Christchurch, and Hodgkins from Dunedin, relatively rich towns that were largely unaffected by the wars that disrupted life in the North Island in the 1860s. Both were from socially prominent, middle-class families, and both, especially Stoddart, had the advantage of early formal instruction in art.

MARGARET OLROG STODDART⁴⁷ (1865–1934), for over fifty years a leader in the Christchurch art community, was born on 3 October 1865 at Diamond Harbour, near Lyttleton, on the Banks Peninsula south of Christchurch. She was the third of seven children (one of whom died in childhood) of Mark Pringle Stoddart and his wife, Anna Barbara, née Schjött.

A descendant of an old Scottish Border family, Mark Stoddart was born and educated in Edinburgh; his father was an admiral. At age eighteen he left Scotland and by about 1837 was sheep farming in Victoria, Australia. Following the droughts of the 1840s, he and a friend chartered a ship and moved their flocks to Canterbury, arriving in 1851. His sheep-run on the Rakaia River about thirty miles south

of Christchurch turned out to be less than satisfactory. After a few years he abandoned station life and bought land on Banks Peninsula at a bay later named Diamond Harbour, a short boat trip from the port of Lyttleton, harbor for Christchurch (figure 3.2). Settling on this 450-acre holding, he was soon well established as a respected member of the community, farmer, stockholder, and justice of the peace. His house at Diamond Harbour still stands, recently restored by local volunteers; set in a shady garden in a sheltered site overlooking the bay, it was originally a prefabricated, hardwood cottage imported in sections from Australia during the midcentury gold rushes. In 1862 Stoddart married Anna Schjött, who was then living at Okains Bay at the end of Banks Peninsula. The daughter of an impoverished Norwegian clergyman, Anna was a relatively well-educated young woman who had come to New Zealand as an assisted immigrant to work as a governess.

Stoddart strongly encouraged his children's awareness of landscape and appreciation of the native flora. He had wide interests in science and the arts and was a good naturalist, very conscious of the beauty and variety of New Zealand's distinctive plant and animal life; problems of acclimatization particularly attracted his attention. Among his close friends were Julius Haast and Thomas Henry Potts, both of whom were scientists and men of influence in the Christchurch community. The social interactions of these two with the Stoddart family undoubtedly widened young Margaret's horizons. Potts, a noted naturalist and conservationist, established a garden at his home at nearby Ohinetahi, Littleton Harbour, which was widely known for its picturesque fernery and the great variety of its plant life.⁴⁸ Geologist Haast, who explored extensively in the Southern Alps in the early 1860s, was director of the Canterbury Museum.⁴⁹

The Stoddarts made two trips to Europe, one in 1866 and the second in 1876, when Margaret was about eleven. During her stay in Edinburgh of almost four years she attended Edinburgh Ladies College, where she probably had some formal instruction in drawing and painting. She almost certainly came to know well both her artist aunt Frances Stoddart (who exhibited at the Royal Scottish Academy and the Royal Academy) and her uncle, Admiral James Stoddart, a capable watercolor painter. When the family returned to New Zealand in 1881, they did not go back to Diamond Harbour but, largely for the sake of better educational opportunities for the children, sold part of their Diamond Harbour land and bought a house in the affluent Christchurch suburb of Fendalton. By then Mark Stoddart's failing health and poor eyesight prevented him from taking paid employment, and money was most likely in short supply. Nevertheless, Lismore Lodge, the family home, soon became a popular meeting place for artists and naturalists, particularly botanists; Anna Stoddart was well known for her hospitality.

When Canterbury College School of Art opened in 1882, all four of the Stoddart sisters, Frances, Margaret, Mary, and Agnes, were enrolled. Margaret spent several years there, completing her studies in 1890 when she was twenty-five. In 1889 she was awarded a second-grade full certificate. During this period she lived in the family home, contributing any money she made by sales of paintings toward the upkeep of the household. Regular employment opportunities for middle-class women were few, except for teaching, the occupation followed by Frances Stoddart, who took a B.A. degree at Canterbury College in 1893.

Margaret Stoddart's flower paintings had strong popular appeal and sold fairly well, some being bought by respected institutions such as the Canterbury Society of Arts. Physically strong and energetic, Margaret loved the outdoors and took long tramps into the nearby hills, as well as lengthier expeditions by horse and dray into the mountains. In 1886–1887 she spent a year on the Chatham Islands, the small group in the South Pacific about 650 miles east of Christchurch (figure 3.3). Staying at the home there of her childhood friend Mabel Potts, she painted the distinctive island flora in all the seasons; she had a rich collection of subjects.

Because of long isolation from the mainland, the flora of the Chathams, while essentially that of New Zealand, includes several outstanding endemic species, many unknown until the early 1860s. The most famous of these is the beautiful giant forget-me-not (*Myosotidium nobile*), also called the Chatham Islands lily, found nowhere else in the world. Now exceedingly rare because of root destruction by pigs introduced by Europeans, it was once found all around the coast of the largest island, in sandy areas near the sea; the combination of its numerous blue flowers and its broad, shining, foot-long leaf blades make it a spectacularly handsome plant. Another of the distinctive island species is the shrub known as the Chatham Islands aster, *Olearia semidentata* Decne; a bog-loving plant, it produces a

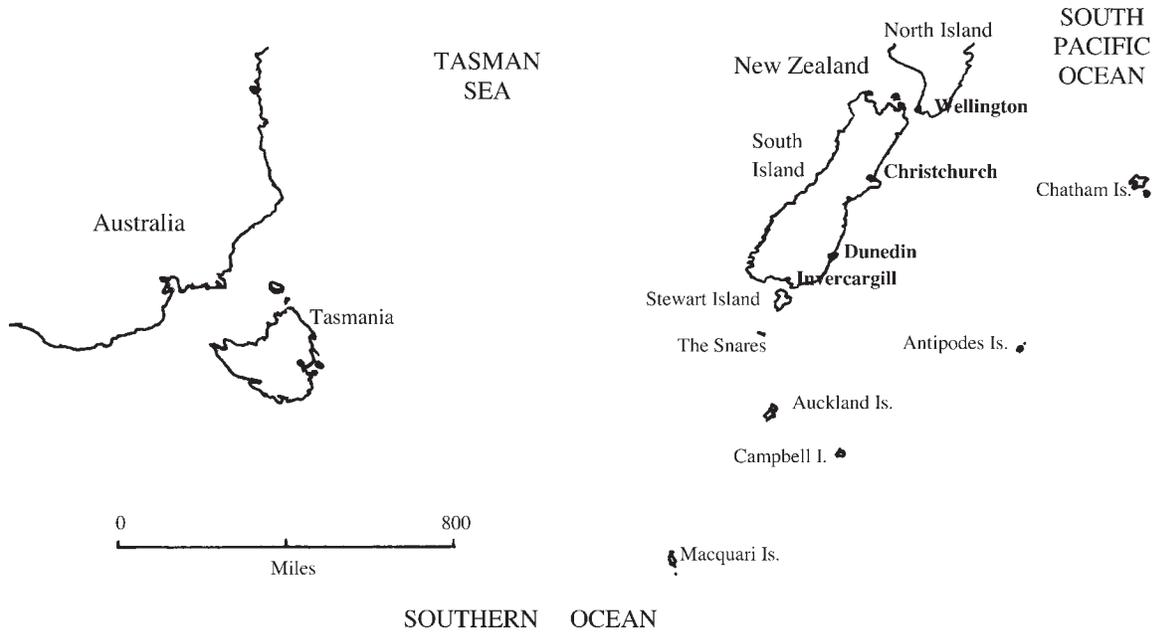


Figure 3.3. Subantarctic Islands, New Zealand.

dense covering of vivid purple flower heads in the summer season. Among the trees of the islands, the commonest and the largest is the karaka, *Corynocarpus laevigata*, a broadleaf evergreen known in other countries as the New Zealand laurel. A tree of the New Zealand coastal and lowland forests sometimes reaching a height of fifty feet, the karaka has masses of large orange berries in the autumn that make it particularly attractive. The karaka is noteworthy in another respect as well: its smooth bark offered a convenient surface for the artistic work of the Chatham Islands' earliest inhabitants, the Moriori.⁵⁰ Margaret Stoddart's paintings of Moriori tree carvings in the karaka groves and scenes from Moriori burial places are useful additions to ethnographic records. Two of her Chatham Island scenery paintings were acquired by the Canterbury Museum in 1887; three years later the museum's herbarium bought twelve more of her studies. She made a second visit to the Chathams in 1891.

Her close friendship with the Canterbury Museum's first director, Julius Haast, may well have helped to bring her work to the favorable notice of the museum committee members even after Haast's death in 1887. Her friendship with the successful Australian flower painter Ellis Rowan (see the section on Australia, above), whom she had met during Rowan's New Zealand visit in 1894, was also a helpful influence in her career. Rowan later wrote:

I had the pleasure of meeting her [Stoddart], and next morning went to see her whole collection. It was a revelation to me to see such work hidden away, and I think she stands without rival the first and foremost of our flower painters in Australia. Her grouping, colouring, form and harmony were perfect.⁵¹

Encouraged by Rowan, she exhibited successfully in Melbourne in 1894. Her work also won much praise at the Auckland Society of Arts.

In addition to her visits to the Chatham Islands, Margaret Stoddart made another especially notable early plant-collecting trip, in April 1896, with her older friend and fellow-artist Rosa Dixon, her brother Jack, and her sister Mary. Their six-day expedition into the South Island backcountry took them along the narrow, winding road over Arthur's Pass high in the Southern Alps, through the Otira Gorge (earlier visited by Georgina Hetley), and down the Bealey River to the west coast (figure 3.2). The full and elegantly illustrated record Margaret kept of the trip included several photographs, as well as her many sketches of the wild mountain landscape and its distinctive vegetation; most of the photographs were probably taken by Mary Stoddart, who along with their older sister Frances shared Margaret's interest in photography. Notable among Margaret's watercolors of alpine plants and flowers was her *Alpine Flowers and Moss from Bealey*, shown at the New Zealand Academy of Fine Arts Exhibition later in

1896. Thanks to her work, “The West Coast Road and Otira are inscribed conclusively in the history of New Zealand art.”⁵²

By the late 1890s Margaret, then in her early thirties, had decided she would have to spend some time in Europe if she wanted to make further progress as an artist. After a short stay in London, she took up residence in the old Cornish fishing village of St. Ives, home of an artist colony, and lived there for most of the nine years she was away from New Zealand. She also made extended trips to France, Italy, and Norway (her mother’s birthplace).

Always short of money, since few of her paintings sold, she nevertheless took lessons when she could and learned new techniques. Freed from the constraints of colonial society and strongly influenced by the impressionist movement, she developed her own style. Her overall success in Europe was about equal to that of any of her fellow New Zealand artists about the time;⁵³ several of her paintings were exhibited at the Royal Institute of Painters in Watercolour, the Society of Women Artists, and the Royal Academy in London, as well as at institutions in Paris and Rome.

She returned to Christchurch in November 1906 and joined her mother and two sisters at Diamond Harbour. Mark Stoddart had died in 1885, and the two Stoddart sons went to South Africa in the 1890s. In 1892, following the financial collapse of the Lyttleton ship chandler to whom Mark Stoddart had earlier sold part of his Diamond Harbour land, a portion of the holding, including a fine, two-story residence, reverted to the Stoddarts. Although she intended to go back to Europe after a year or so, Margaret changed her plans following the death in 1909 of her younger sister Mary. Mary had married the previous year and died in childbirth, leaving a daughter, Frances, whose upbringing became a major responsibility for Margaret and her sister Agnes; the third sister, Frances, was still much involved in her teaching career, at that time in Motueka on the South Island’s north coast.

From then on most of Margaret’s paintings were Canterbury landscapes, pictures of typical regional features, from alpine scenes to suburban gardens; some of her most popular subjects were places around Diamond Harbour that she had known from childhood. A busy and prolific artist, she worked continuously all the rest of her life, her picture sales augmenting the family’s limited resources. In 1913, two years after the death of Anna Stoddart, the Diamond Harbour property was sold, and Margaret and Agnes, with their four-year-old niece, moved back to Christchurch. By 1914 they were living in Cashmere, a suburb in the beautiful Port Hills region to the south of Christchurch, about three miles from the city center. Apart from a trip to Australia and Tahiti about 1926, Margaret remained in New Zealand from then on.

In her later years she was very prominent in the Canterbury art community, and her contribution to the development of impressionistic and regional (landscape) painting in the 1920s and early 1930s was noteworthy. A member of the Christchurch Artists’ Sketch Club and the National Art Association of New Zealand, she also served as vice president of the Canterbury Society of Arts and of the Society for Imperial Culture. She was a regular exhibitor with New Zealand art societies, and in 1928 the Canterbury Society of Arts held a large retrospective exhibition of her work.

For some time she taught at Canterbury College of Art, as well as giving private lessons. Despite the fact that they considered her somewhat old-fashioned in style, “schoolmarmish” and forthright, her students recognized her as a fine teacher. Much respected by both critics and fellow artists,⁵⁴ she unquestionably had a considerable influence on the next generation of Canterbury artists. She died at age sixty-nine, of a heart attack, on 10 December 1934 while at the alpine village of Hanmer, about seventy-five miles north of Christchurch.

ISABEL JANE HODGKINS,⁵⁵ later FIELD (1867–1950), the elder daughter in the family of six children of William Mathew Hodgkins and his wife, Rachel, was born in Dunedin in 1867. William Hodgkins, the son of a Liverpool brush maker, lived during his earliest years in the city’s dockside slums. His family seems to have prospered and moved on; William had at least a basic education and by the time he was in his early twenties was working as a clerk in the patent office of a London printing firm. He emigrated to Melbourne in 1860, the rest of the Hodgkins family having preceded him; he is thought to have been living in Dunedin by 1862, most likely attracted by the Otago gold rush of the 1860s. Dunedin was then the main city of the colony and the commercial capital of New Zealand; wealth from the goldfields was leading to rapid development in education and the arts. Rather than prospecting, Hodgkins became a lawyer’s clerk while also studying law. He was admitted to the Otago bar in 1868, three years after his marriage to Rachel Owen Parker, the daughter of a Sydney coroner.

Isabel Hodgkins grew up in a family where art and the promotion of all matters related to art were of central interest. From the late 1860s until his death in 1898, her father was a leading figure in the Dunedin arts scene. During his years in London he had spent much of his free time studying the works of J. W. Turner and others at Hampton Court and the National Portrait Gallery; ambitious and persevering, he gradually developed his native artistic talent, becoming a successful landscape painter in the romantic, Turneresque style. In 1875 he founded what soon became the Otago Art Society, of which he was president for the last seventeen years of his life. He was also the moving spirit in the Dunedin Art Club and played a leading role in founding the Dunedin Public Art Gallery, the first such institution in New Zealand.

In the years after the economic depression of the 1870s, the family lived modestly; but unlike the four sons, Isabel and her younger sister, Frances, were educated at a private school, Braemar House. Run by a forward-looking Scotswoman, Jessie Dick, the school offered a wide range of academic subjects, as well as music and painting, but art was the main interest of both the Hodgkin sisters.

By the time Isabel was in her teens she had become a fairly widely recognized artist, known for her landscapes and flower studies in particular; accepted as a member of the somewhat exclusive Art Club, she had no lack of mentors. In 1884, when still only sixteen, she was elected a working member of the Otago Art Society, and a year later she sold her first painting. By 1888 she had earned enough money from her landscapes and flower studies to finance a trip to Melbourne to visit relatives and attend the city's Centennial Exhibition of that year. On her return to Dunedin in 1889, she joined her father in the work of organizing the art section of the New Zealand and South Seas Exhibition, an event to be held in Dunedin in 1889–1890 as part of the celebration marking the jubilee of the accession to Britain of the colony of New Zealand. Three of Isabel's watercolors—two landscapes and a flower study—were among the works of British and colonial artists chosen for exhibit, a notable achievement for a young woman of twenty-three.

While visiting a fellow artist in Wellington in 1891, she met Wellington solicitor William Hughes Field (1861–1944), whom she married two years later. From about then she did less and less painting and began to have serious doubts about her talent. During her early years, inspired by careful tuition from her father, she had outshone her younger sister, Frances, in her artistic achievements, but by the 1890s Frances was beginning to find a place in the art world.

Frances Hodgkins had always rejected the Turneresque style of her father that Isabel had adopted, her interests instead focusing on the human figure. By the time she matured she had unquestionably joined the impressionist and postimpressionist schools; she went on to earn a secure place among the English avant-garde artists of the 1930s and 1940s, the first New Zealand-born artist to achieve such stature.⁵⁶ Isabel's style, on the other hand, was dropping out of fashion by the 1890s, the closing years of the Victorian era, when change in the New Zealand visual arts scene was proceeding rapidly. She still exhibited in Wellington with the New Zealand Academy of Fine Arts and at the Otago Art Society, occasionally selling some pictures; for a number of years between 1898 and 1904 she served on the council of the New Zealand Academy of Fine Arts. After 1904 she did very little painting, occupying herself instead with the upbringing of her five children and taking part in Wellington social life. Her husband, a hardworking and successful lawyer, spoke Maori and had a particular interest in laws relating to the Maori people. In 1900 he was elected as a Liberal member to the New Zealand House of Representatives, and except for one three-year break (1911–1914), he held his seat for thirty-five years.

After her father's death in 1898, Isabel Field shared her Wellington home with her mother, who had been left in somewhat straitened circumstances. Although it has been suggested that Isabel's greatest contribution to art was the unstinting support and help she provided for her younger sister in her career in Europe, the landscapes and flower studies she produced during her early years in Dunedin were creditable contributions to South Island nature art of the late nineteenth century.

An Early Plant Photographer

“Probably no book has done so much to assist the amateur botanist and Nature lover to secure an accurate and vivid knowledge of the flora of New Zealand. No publication has done so much to educate

and delight the general public interest in our plants.”⁵⁷ The coauthor of the work referred to, the classic *Plants of New Zealand*,⁵⁸ was Ellen Wright Blackwell. The book was the first semipopular and readily available guide to New Zealand flora.

ELLEN WRIGHT BLACKWELL⁵⁹ (1844–1952), the sixth daughter and ninth child of John Blackwell, a master hosier, and his wife, Annie Marie, née Bumpus, was born in Northampton on 7 October 1864. Little is known of her childhood or education, but by her mid-thirties she was writing illustrated religious books for children under the pen name Grace Winter.⁶⁰ She also developed a strong interest in botany.

In 1903, when she was thirty-nine, she sailed for New Zealand to visit two of her brothers, Frank and William Blackwell, who had gone there some twenty years earlier and were farming on the Pahi River at Kaipara Harbour, the large inlet on the western side of the North Island near the base of the North Auckland peninsula (figure 3.1). En route she came to know a fellow passenger, Christchurch amateur botanist Robert Malcolm Laing (1865–1941),⁶¹ already well known for his important work on marine algae. The two botanized together at some of the ship’s ports of call and remained in touch during Ellen’s stay in New Zealand.

The lush, semitropical plant life in the region around the Blackwell farm at Kaipara Harbour made a deep impression on Ellen, as it had done on her brother Frank. Frank had also become interested in photography, developing considerable skill, and he evidently gave his sister some instruction in the art as well.

Over the course of Ellen’s stay of about four years, she and Frank visited many regions of the country and then joined Robert Laing in producing the comprehensive and well-illustrated *Plants of New Zealand*, which included 160 original black-and-white photographs taken by the Blackwells. A number of colored illustrations were added in later editions, and by the seventh edition, revised by botanist Eric Godley and published in 1964, the work had been expanded to 500 pages from the original 456. The book’s remarkable success was due not only to its comprehensive coverage, which included all the common flowering plants (except for the grasses) and its skillful use of photographs, but also to the replacing of some of the technical terminology in plant descriptions by more everyday language. Additional popular features were the notes on Maori plant usage. Contemporary reviewers credited the work largely to Robert Laing, already a well-recognized author of botanical papers, and he was most likely the major author of most of the book’s clear descriptive notes. But since he lived in Canterbury and worked mainly on the flora of the South Island, particularly that of the Banks Peninsula and the Canterbury foothills, it is Ellen Blackwell and her brother who are thought to have contributed a considerable part of the information on the flora of the North Island. This probably included the descriptions of such trees as the distinctive Nikau palm tree (*Rhopalostylis sapida*) of the northern coastal and lowland forests, the only palm species native to mainland New Zealand, and the Pohutukawa (*Metrosideros tomentosa*, or *M. excelsa*), a coastal evergreen of the myrtle family known to reach the impressive height of 60 feet and a spread of 120 feet; the brilliant crimson flowers that cover the tree from November to January have earned it the common name New Zealand Christmas tree.

Ellen Blackwell’s life and botanical work in New Zealand were largely forgotten for more than four decades, until the 1987 publication of the historical account *Seven Lives on Salt River* provided some information about the Blackwell family of Kaipara Harbour and rescued Ellen from obscurity.⁶² She returned to Britain shortly after the flora was published in 1906 and did not visit New Zealand again. In 1910 she married a widower, Thomas Maidment, the branch manager of an insurance company. After the first (1907) revision of *Plants of New Zealand*, she left the work of bringing out the next two editions (1927 and 1940) to Robert Laing. Notes and outlines for the first revision may well have been discussed before she left New Zealand, and the long times then required for communication between Britain and New Zealand would have handicapped later collaboration. Ellen does not appear to have brought out any other botanical work but in the 1920s returned to her early hobby, writing religious books for children. For middle-class women of her time, devoting oneself to family concerns and religious interests was hardly an uncommon lifestyle. Ellen Blackwell died in the Royal Portsmouth Hospital on 24 September 1952, two months before her eighty-eighth birthday.

Contributors to Astronomical Studies

The history of human settlement in New Zealand, beginning with the arrival of the first Maoris, is strongly intertwined with aspects of astronomical knowledge.⁶³ Although there is no record of any women playing an active role in this area before the late nineteenth century, a few words about the importance of astronomy in early New Zealand history are perhaps of interest.

The extent to which the Polynesian navigators supplemented their extensive understanding of winds and ocean currents with observations of stars on their long sea voyages remains somewhat unclear, but Maori mythology, handed down by word of mouth, indicates that they had good knowledge of the positions and motions of the major constellations and the brighter planets and used these for navigation; the North Star, wherever visible, and the Southern Cross were especially valuable. One historian described the Maoris as “the foremost Neolithic navigators of the grey ages.”⁶⁴ With its close links to their rich mythology, sky knowledge developed early in Maori culture; the sky father, Rangi, and the earth mother, Papa, produced the Sun (Te Ra), the Moon (Te Marama), and the stars. As did later astronomers, the Maori learned men provided time and calendar services, using changing star patterns to indicate times for such activities as planting and harvesting.

The arrival in New Zealand of James Cook, some five centuries after the first Maori settlers, followed from his being sent to Tahiti to observe the 1769 transit of Venus. This mission completed, he proceeded on to New Zealand to carry out coastline mapping; important astronomical observations from the Coromandel Peninsula in the North Island were also made. Two later expeditions, in 1773–1774 and 1777, resulted in extensive latitude and longitude investigations around the South Island coasts; using precise chronometers, Cook’s astronomer made observations at both Dusky Sound at the southwest of the South Island and at Queen Charlotte Sound at its northern tip.

Within a relatively short time of the coming of European, mainly British, settlers in the nineteenth century, a number of outstanding amateur astronomers were carrying out notable observational work. Using small telescopes in private observatories, some worked individually and alone, others in groups. Among them were English immigrant John Grigg (1838–1920), of Thames in the North Island, now internationally recognized as the discoverer or codiscoverer of three comets that bear his name; he was also the first to carry out astrophotography in New Zealand.⁶⁵ Other early observers included James Townsend (1815–1894) in Christchurch and Arthur Beverly (1822–1907) and Henry Skey (1836–1914) of Dunedin.⁶⁶ Skey, the government meteorological observer in Dunedin throughout the 1870s and probably much longer, presented papers on weather and astronomical observations before the Otago Institute from about 1870 until 1902.⁶⁷

Records of early, informal, amateur groups such as those known to have flourished in Dunedin and Auckland remain undiscovered, but these groups may well have included a few women. Newspaper reports indicate widespread public interest in sky phenomena among Dunedin residents from the 1860s. Even in the absence of any organized club or society, the community’s astronomers with private telescopes made their instruments accessible to their fellow citizens, and large numbers responded: “At the corner of Stafford St. near the Provincial Hotel, there was a nightly congress of Star-gazers. A telescope on a stand is farmed out by an enterprising speculator and the public, upon payment of a small fee, may have an interview with the man in the Moon and half an hour’s worth of the best stars.”⁶⁸ By the 1870s and 1880s, papers read before the Otago Institute (founded in 1869) and then published in the *Transactions and Proceedings of the New Zealand Institute* regularly included reports on astronomical subjects. Two women, Mrs. Burn and Mrs. J. T. May, are listed as having been ordinary members of the institute in the mid 1870s, but neither appears to have presented papers in astronomy or any other subject.⁶⁹

In the Auckland district, John Grigg, who was initially inspired to take up astronomical work by the anticipated 1874 transit of Venus, later welcomed visitors into his observatory; shortly after the turn of the century he also began giving public lectures on photography and other scientific subjects, as well as on astronomy.⁷⁰ The astronomical activities of Thomas Cheeseman (1815–1907) from at least the 1870s until the time of his death also had an impact on science in the North Island. Cheeseman’s observatory at his home in Remuera, Auckland, became a meeting place for others with similar interests, and from this group is thought to have developed the first Auckland Astronomical Society, founded by his son, Thomas Frederick Cheeseman, in 1920.⁷¹ Considering the younger Cheeseman’s support of

women's work in botany and his sisters' active participation in his scientific undertakings (see the section on botanical artists), one might well wonder if at least a few interested women were not included in this society and its parent group. No written records of the elder Cheeseman's astronomical work have survived.

Among the earliest women known to have had interests in sky phenomena and astronomical work in New Zealand were Miss Hirst, Mary Steadman Aldis, and Sarah Salmond, who were all active before the turn of the century.

Miss HIRST (fl. 1860s, 1870s), an early resident of Auckland, was a keen observer of planets and meteors over a period of many years, starting about 1859. She used a Browning eight-and-a-half-inch silvered-glass reflector telescope, kept a diary of detailed notes of her observations, and was familiar with the current literature in the field. Auckland astronomer Professor S. J. Lambert, fellow of the Royal Astronomical Society, remembered for his work in planetary observations and stellar photography, considered her a practical and capable observer whose reports could be relied on.⁷²

Her diary entries for the four months February to May of her observations of the changes in the color belts and zones of Jupiter during the planet's 1875 opposition were published in the Royal Astronomical Society's *Monthly Notes*. The description she gave of "a small oval patch of a decided sea-green" a little to the east of the south pole was quoted and commented on, especially by Sydney astronomer G. D. Hirst in an 1876 paper; he himself had observed this kind of rarely seen green tint near the planet's north pole.⁷³ S. J. Lambert, who communicated Miss Hirst's work to the Royal Astronomical Society on her behalf, was quite familiar with her astronomical activities over many years and considered her work valuable. In his report to the astronomical society he noted that "Her diary contains some valuable information on Meteoric Showers, observed in Auckland, which I will send you at some other time."⁷⁴

MARY STEADMAN ALDIS,⁷⁵ née ROBINSON (d. 1897), daughter of the Rev. William Robinson, pastor of the Baptist Chapel, St. Andrews Street, Cambridge, was probably born in the early 1840s. In 1863 she married mathematician William Steadman Aldis (1839–1928), a Cambridge graduate, son of Baptist minister the Rev. John Aldis of Southwark, London. They had at least three children, daughter Amy L. Aldis and two sons, both of whom became artists.⁷⁶ Following the appointment in 1884 of William Steadman Aldis as first professor of mathematics at Auckland University College, the family moved to Auckland.

A well-educated woman, Mary Aldis had strong interests in mathematics and science and was a staunch supporter of the advancement of women's rights, including the right to higher education. She brought out an elementary arithmetic book, *The Giant Arithmos*,⁷⁷ in 1882, but her most notable publication was her elementary, nonmathematical introduction to astronomy, *Consider the Heavens*, a 224-page illustrated volume that included some notes on the history of astronomy.⁷⁸ Despite the many biblical quotations she introduced, it is a scientifically informative work, written in a personal, conversational style that draws along the ordinary reader. For example, when describing lunar craters, identified as extinct volcanoes, she offered a familiar Earth comparison with the volcanic craters near Auckland; likewise her discussion of the advantages enjoyed by New Zealand observers of Jupiter has a lively, intimate tone. Writing, as she says in the preface, under the supervision of her husband, she avoided the more speculative interpretations of planetary observers accepted by many astronomers at the time. Thus she had little to say about the idea advanced by Italian observer Giovanni Schiaparelli (1835–1910) that the channels, *canali*, he saw on Mars were evidence of advanced life. Despite Schiaparelli's reputation as something of a specialist on that planet, she chose instead to cite a very recent, tightly argued presentation of spectroscopic data that was for long largely ignored by other astronomers but has been amply confirmed in recent years by spacecraft observations of Mars.⁷⁹

Mary Aldis was responsible for one other literary undertaking, the editing of a much-abbreviated reissue of a somewhat controversial work on Church of England doctrine.⁸⁰ First published in 1860 by her father, William Robinson (1833–1872), it had two later editions but by 1886 was long out of print. As nonconformist Baptist dissenters from the established Anglican Church, both she and her husband had strong, personal interests in the subject.

Within about two years of his arrival in Auckland, William Steadman Aldis, who had had a somewhat puritanical upbringing, began to speak out forcefully on moral and religious issues, particularly the evils of prostitution, then licensed in Auckland. Mary joined him fully in this effort, and indeed

much of the work of keeping such issues before the public fell to her, her husband necessarily spending most of his time on academic matters. She also kept abreast of developments in Britain in the suffrage movement and higher education for women, making contacts with Millicent Garrett Fawcett, founder of the suffrage movement, and with Emily Davies of Girton College.⁸¹ William Steadman Aldis was also a strong supporter of higher education for women; when in 1890 Cambridge University declined to award Newnham College student Philippa Fawcett the title Senior Wrangler, traditionally bestowed on the candidate with the highest score in the mathematical tripos examinations,⁸² Aldis suggested publicly that she be offered a University of New Zealand M.A. degree.⁸³ The success of the suffrage movement in New Zealand in 1893 must have brought Mary Aldis much satisfaction.

Aldis was acknowledged to be a good lecturer, well liked by his students, among whom were several women; in addition to his college course he gave popular public lectures on geometrical astronomy. Nevertheless, his career in Auckland came to a distressing close. His intemperate rhetoric and the consistently contentious relationship between the Auckland college professors and their governing council, as well as a certain amount of criticism from the academic community in Britain, led to his dismissal in 1893 by Sir Maurice O'Rorke, an Irish Presbyterian minister then chairman of the college council. Aldis petitioned for reinstatement, and the matter became a national issue, but a new mathematics professor was appointed in 1894.

Three years later, early in 1897, William and Mary Aldis returned to Britain. Mary died in June of that year, her health having been poor for some time. Aldis never again held an academic position, despite his being a competent, hardworking, and productive mathematician who published at least five substantial works between 1870 and 1893.⁸⁴ His journal publications in astronomy continued until about 1902.

SARAH SALMOND,⁸⁵ née COCKBURN (1864–1956), long resident of Queenstown in the high country in the south of the South Island (figure 3.2), was an enthusiastic star watcher for most of her life. As far as is known, she left no written records relating to her astronomical observing, her interest being purely private recreation shared with her brother George, whose small library of books on astronomy were most likely her only guide. Her contribution to astronomy was her many-year effort to have a memorial plaque placed on the site at Queenstown where an American expedition obtained a sizable collection of photographs of the 1874 transit of Venus. She herself unveiled the monument in 1953.

Born on 7 August 1864 in the parish of Abbey St. Bathans, Berwickshire, on the southern side of the Lammermuir Hills in the Scottish Southern Uplands, Sarah was the youngest of the seven children of John Cockburn, a farm laborer, and his wife, Elizabeth, née Liddle. In 1872, to escape a life of grim poverty, John Cockburn moved his family to New Zealand, joining his eldest son, George, already in the South Island. Leaving one daughter in Berwickshire, the Cockburns sailed for Dunedin on the *Zealandia*, arriving on 4 January 1873. A long journey by bullock cart brought them to the settlement of Cromwell on the Clutha River in the Southern Alps, where George was farming. A year later the family moved some thirty miles farther west through high mountain territory to the village of Queenstown on Lake Wakatipu. Sarah, then about nine years old, had her only formal education at the Queenstown local school, which she attended for two years. It was about this time that the event occurred that may well have kindled her lifelong interest in astronomy.

Having chosen Queenstown as one of the sites for an observing station for the eagerly awaited 1874 transit of Venus, a United States Naval Observatory expedition duly arrived in October of that year and set up a station on the shores of Lake Wakatipu. The well-equipped party of six men was headed by astronomer C. H. F. Peters of Litchfield Observatory, who presented a stirring public lecture that young Sarah Cockburn probably attended.⁸⁶ The success of the party, which managed to take a considerable number of usable photographic images, would perhaps have impressed the people of Queenstown as a satisfactory outcome for a scientific expedition to their remote district.

By the time Sarah was eleven, her mother was often away from home, carrying out the duties she had undertaken as one of the area's midwives; Sarah therefore had to forgo the luxury of school to keep house for the family—no slight task for an eleven-year-old girl in those days in rough, newly settled country. Four years later, when she was about fifteen, she took on even more-demanding work, housekeeping for her brothers George and David, who by then were attempting to establish a farm in the wild country of the Rees River valley at the head of Lake Wakatipu; she was the first female set-

tlar in this high, mountainous region. Atmospheric conditions there were ideal for George Cockburn's sky-watching hobby, and Sarah joined him enthusiastically in this activity.

When she was about eighteen, despite her own lack of formal education, she became governess to three children on a remote sheep station; she taught them to read, write, and carry out simple arithmetic, an experience that brought home to her the value of adequate elementary education. A short time later, during a visit to Queenstown for supplies, she met a young carpenter, John Salmond, from Torpichen, West Lothian, Scotland, recently arrived in the district. They were married in 1886. Like her husband, Sarah Salmond was a strong Presbyterian, a member of the Queenstown St. Andrew's Presbyterian Church for more than seventy years. Three of her eight children became leading figures in New Zealand Presbyterianism.

Sarah never forgot the 1874 visit of the American astronomers to Queenstown, and the eventual placing, almost eighty years later, of a plaque marking the expedition's site must have given her considerable satisfaction. Her two great interests, religion and astronomy, were expressed clearly in her choice of reading material during her last illness: her Bible and the small astronomy and religion booklet *The Heavens Declare*.⁸⁷ She died on 15 October 1956, about two months after her ninety-second birthday, in Ross Home, Dunedin, having outlived her husband by sixteen years. She was survived by six of her children. The work *Hearts of Gold*, published by James David Salmond six years after Sarah Salmond's death, included some of her reminiscences about life in Queenstown in the late nineteenth century.⁸⁸

UNIVERSITY GRADUATES: PIONEERING WOMEN TEACHERS AND PHYSICIANS

Although few New Zealand women published scientific papers before 1901 that are listed in the Royal Society's *Catalogue*, several did study science subjects at university level in the 1880s and 1890s. Many of them became teachers in the girls' high schools then being founded in cities throughout New Zealand; others proceeded on to medical degrees. Brief sketches of the careers of some who did not carry out any research are included here, since their work was of considerable importance in the young country where physicians and well-trained teachers were in short supply.

In spite of New Zealand's relatively late settlement by Europeans and its greater geographical isolation than that of the other two Southern Hemisphere countries included in this survey, its record of establishing public education compares favorably with that of Australia and even more so with that of South Africa. Otago Province founded its first university in 1869 and admitted women from 1871; its neighbor to the north opened Canterbury Collegiate Union in the still-small settlement of Christchurch in 1873, accepting women from 1874. The dates for the admission of women compare especially well with those for the first three universities established in Australia's colonial capitals. Neither the University of Sydney, opened in 1850, nor the University of Melbourne, opened in 1853, accepted women students until 1881; the University of Adelaide opened to both men and women in 1874.

University of Otago

The University of Otago, Dunedin, was established by provincial ordinance in 1869 at the close of a decade of notably rapid progress in the provision of public education in Otago Province.⁸⁹ Within about two decades of the arrival of the first permanent European settlers, Otago, led by the Scottish community of Dunedin, had put in place a system of district schools; there were also a number of secondary schools for boys. In the 1860s, Dunedin, the province's main town, was still a small colonial settlement of narrow, dusty, straggling streets, but it was nevertheless developing rapidly, thanks in large part to wealth from the province's goldfields; new buildings were rising, public transport was being organized, and gas, water, and sewage systems installed. By the late 1860s the Otago Institute had been set up and a natural history collection established; the latter led soon after to the founding of the Otago Museum.

A campaign for provision of secondary education for girls began about 1863, following the opening that year of Otago Boys' High School. The effort was led by Scottish immigrant Learmonth White Dalrymple. Then a woman in her mid-thirties, Learmonth Dalrymple had attended classes at Madras College, St. Andrews,⁸⁹ and had also traveled in Europe before emigrating to New Zealand in 1853.

Seven years of hard canvassing and campaigning, collecting and presenting petitions to the provincial council, counteracting opposition from some sections of the community, and patience in the face of much procrastination from the council finally produced results. Dalrymple had help and advice from her friend and neighbor Sir John Richardson, speaker of the council, as well as the support of an informal group of Dunedin women, but a great deal depended on her own quiet perseverance. The plan she submitted to the provincial education board was based on the ideas and advice of Frances Buss, principal of the North London Collegiate School for Girls and a well-known leader in the late nineteenth-century movement to provide sound academic education for girls up to university entrance standards.⁹¹ The first public high school for girls in the Southern Hemisphere, Otago Girls' High School, opened in space shared with the Otago Boys' High School in Dunedin in February 1871. Under the leadership of the first principal, Margaret Burn,⁹² another Scot, the initial roll of 78 pupils increased to 130 before the year was out. Following the move of the boys' school to new accommodation in 1885, the girls' school had full occupancy of the formerly shared building. The institution now has an enviable reputation as an excellent, up-to-date school, with about eight hundred pupils, including a sizable number of girls from other Pacific countries.⁹³

The opening came at an opportune time, two years after the founding of the University of Otago. Thanks to the continued lobbying by Dalrymple, strongly supported by a number of the wives of prominent men in the community, the university council voted to admit women to all classes and to allow women to compete for all certificates within a month of the opening of the high school; regular matriculation started in 1872. The driving force in the council's decision to admit women was the strong and steady demand for qualified teachers, particularly graduates for senior positions, rather than any general idea about the rights of women to prepare for careers;⁹⁴ "moral refinement" within the family remained a dominant theme in the education of girls in New Zealand long after the close of the nineteenth century.⁹⁵

It took time for Otago Girls' High School to bring its pupils to the level required for matriculation, but between 1885 and 1900, the first fifteen years of the awarding of degrees to women, 62 percent of the University of Otago's fifty-eight women graduates were former pupils of Otago Girls' High School. With a few exceptions, including four girls from Southland Girls' High School in Invercargill, Southland, most of the others were also from Otago Province. These early women students came mainly from the middle classes; they were the daughters of farmers, blacksmiths, town clerks, ministers, and others, and nearly all were of Presbyterian persuasion. After graduation the main career option open to them was teaching, at either primary or secondary level. Indeed, the first generation of University of Otago women were pioneers in education for girls and women. They went on to make higher education and professional training possible for the girls who followed them; some founded their own schools. Most took the B.A. degree, only three receiving a B.Sc. in the period up to 1900. It may be noted, however, that the B.Sc. degree course was not established until 1880, and the first B.Sc. degree awarded was in 1889. Further, many students chose science subjects and mathematics in their studies for the B.A.

The careers of two of the first women to receive science degrees are outlined here: Christina Cruickshank, B.Sc. 1900, and Emily Siedeberg, who received her B.Sc. in 1901, five years after completing medical training. Also included are sketches of the careers of three other early women graduates of the University of Otago medical school: Margaret Cruickshank (twin sister of Christina Cruickshank), Constance Frost, and Alice Woodward (later Horsley). Helen Baird (later Cowie) is mentioned as well, although her medical degree was from the University of Glasgow, following her University of Otago B.A. In addition there is a note on Josephine Gordon Rich, who carried out research in the University of Otago biological laboratory but did not graduate. Rich is one of the four early New Zealand women whose work was listed in the Royal Society's *Catalogue* (see bibliography).

The life's work of CHRISTINA M. CRUICKSHANK⁹⁶ (1873–1939) illustrates a pattern followed by many of the most outstanding of the early New Zealand women graduates—that is, those who did not marry and leave professional life within one or two years of completing their degrees. Born on 1 January 1873 in Palmerston, Otago Province, about thirty miles north of Dunedin, she was one of twin girls in the family of seven children of George Cruickshank and his wife, Elizabeth, née Taggart, immigrants from Aberdeen, Scotland. George Cruickshank was an engineer, responsible for road and bridge construction in Waihen County, now a ward of the Waitaki District north of Dunedin. After the premature death

of Elizabeth Cruickshank, the eldest daughter, Anne (later Steel), looked after the family; it is reported that the twins, Christina and Margaret, also helped for a time, taking turns going to the primary school in Palmerston, where they received their earliest education.⁹⁷ From there both went on to Otago Girls' High School, walking the thirty miles from Palmerston to Dunedin at the beginning and end of each term. The two were joint *dux* of Otago Girls' High School in 1891. Encouraged by rector Alexander Wilson, head of the school from 1885 to 1891, Christina competed successfully in university scholarship examinations and proceeded on to further studies. While they were undergraduates, both she and Margaret earned money during university vacations by working as cooks in the Cherry Farm district north of Dunedin. Christina received a B.A. from the University of Otago in 1895. Considering herself less than satisfactorily qualified in the physical sciences, she carried out an additional year of study in mathematics and mathematical physics and was awarded an M.A. in 1896. Still wishing to advance her formal education, she took a B.Sc. in 1900 and an M.Sc. six years later.

After acquiring teaching experience at a number of schools, including Otago Girls' High School and Timaru Girls' High School, Christina Cruickshank went on to notable work as a school principal. A skilled administrator as well as a dedicated and very conscientious teacher, she headed Southland Girls' High School in Invercargill (figure 3.2) from 1907 to 1910 and then moved to Wanganui Girls' College in the North Island; founded in 1891, this school was another of the outstanding institutions of secondary education for girls established about this time.

An articulate person with her own strong and clear views about girls' schools and girls' education, Cruickshank instituted many changes during her two decades as principal. Although she and her staff gave strong encouragement to girls pursuing academic studies, she also broadened the curriculum to accommodate those who wanted to concentrate on such subjects as domestic science or commercial skills (then typing and bookkeeping). After completing a core of basic studies, which included Latin, Wanganui College girls were able to choose between courses leading to university entrance or to alternatives such as teacher training, nursing, or music and fine arts studies; teacher training was a popular goal. Physical education and sports, with participation in regional interschool competition, was also encouraged.

Christina Cruickshank's general ideas on the role and importance of education in the life of the country come through clearly in some of her annual reports to the school's board of governors. She felt strongly the need to foster intellectual development in the best of her pupils, those who would later fill leadership positions throughout New Zealand; Wanganui College girls often did well in university scholarship competitions. Her wide vision also influenced the weight given to particular parts of the curriculum; she saw that the expansion of the British Empire's world influence in the early years of the twentieth century required an increased emphasis on broad geographical studies. The First World War and her stress on patriotism to the empire bound the school community closer together at this period, as the pupils worked enthusiastically to support the various relief efforts being organized. The eventful postwar years also brought out her sound and steady leadership, as she dealt with the influenza epidemic, which caused major disruption of the school's routine; again in 1931 she made considerable urgently required adjustments in boarding accommodations when the devastating Napier earthquake brought large numbers of nervous Hawke's Bay girls to Wanganui College.

From all the available evidence a very satisfactory and trusted school principal, Christina Cruickshank resigned in 1932 at the age of fifty-nine. She settled in an apartment in the Cashmere Hills district of Christchurch, her niece Margaret, still a schoolgirl, joining her there. In 1938 she made an extended trip to the Continent and "home" to Britain, where she dined with England's Lord Chief Justice, whose wife had been one of her pupils at Wanganui College. She was far from well when she returned to New Zealand, and she died on 16 November 1939, about two months before her sixty-seventh birthday, in the private hospital in Christchurch where she spent the preceding winter. Burial was at Waimate, near the grave of her twin sister, who had died twenty-one years earlier. Throughout her brief retirement she had kept in close touch with Wanganui Girls' College and many of her former pupils. In 1947 these Old Girls gave the school a memorial to Christina Cruickshank: a lectern (with Bible), table, and chair, sculpted from Southland beech.

EMILY HANCOCK SIEDEBERG,⁹⁸ later SIEDEBERG MCKINNON (1873–1968), the third child of Franz David Siedeberg and his wife, Anna, née Thompson, was born on 17 February 1873 in the mining

center of Clyde in the valley of the Clutha River, South Island (figure 3.2). Franz Siedeberg, a German-Jewish architect, had emigrated to New Zealand in 1861, attracted by the gold discoveries in Otago Province; his wife was of Irish Quaker background. About 1870, when Emily was three, the family settled in Dunedin, Franz Siedeberg having moved on from his mining venture and become a building contractor in the expanding city.

After attending the Normal School and Otago Girls' High School, Emily, with her father's help, overcame a number of hurdles that stood in her way and enrolled in the University of Otago Medical School. Although there was a distinct lack of enthusiasm for her plans from many groups in the community, opposition was relatively minor, compared to that faced by would-be women medical students in other countries. The dean of the medical school, Dr. John Scott, reluctantly agreed to abide by the university council's decision that medical training should be open to both men and women, and in 1891 Emily Siedeberg became the country's first woman medical student. For a time she was somewhat isolated and constrained, as a result of the firmly expressed directives of both her mother and the dean, but her situation improved in her second year when her former Otago Girls' High School classmate Margaret Cruickshank joined her.

Graduating in 1896, Emily went on to additional training in Dublin and Berlin in obstetrics, gynecology, and children's diseases. She returned to Dunedin two years later and, with substantial financial help from her father, established a private practice, which she kept for thirty years. Her work centered on the welfare of the women and children of the community, a number of honorary appointments increasing her opportunities for effective action. The first medical officer (later superintendent) of St. Helen's Maternity Hospital, Dunedin,⁹⁹ from its opening in 1905, she held this position until the institution closed in 1938. Although her ideas at times generated strong opposition from colleagues, she is credited with establishing this hospital's reputation for successful midwifery. She opened New Zealand's first prenatal clinic in 1918 and in addition, for more than twenty years beginning in 1907, served as medical officer at the Caversham Industrial School (later the Girls' Receiving Home).¹⁰⁰ For a few years after setting up her Dunedin practice, she also found time for further academic study at the University of Otago; her B.Sc. was awarded in 1901. In 1912 she went to Edinburgh for a short period of further medical studies.

Siedeberg was notably active in women's organizations. The many offices she held form an impressive list: president of the Dunedin branch of the New Zealand Society for the Protection of Women and Children from 1933 until 1948 and honorary life president from 1949; cofounder (along with six of her women colleagues) and first president of the New Zealand Women's Medical Association, now part of an international network; foundation member of the Otago University Women's Association; and a New Zealand delegate to the first Pan-Pacific Women's Conference in 1928. Her awards for thirty years of determined effort to improve the lives of New Zealand women included life membership in the New Zealand branch of the British Medical Association (1929), a King George V Silver Jubilee Medal (1935), and a CBE (Commander of the Order of the British Empire) in 1949.

In 1928, at the age of fifty-five, in Los Angeles, she became the second wife of James Alexander McKinnon and thereafter continued her professional work as Emily Siedeberg McKinnon. When she was in her nineties, Otago Girls' High School honored her by naming their new science wing the Emily Siedeberg Block. Opened by Her Excellency Lady Fergusson in 1967, the extension provided three laboratories and a classroom; Dr. Siedeberg McKinnon herself was present at the ceremony. She died soon after, on 13 June 1968, in her ninety-sixth year, at the Presbyterian Social Service Home at Oamaru, having outlived her husband by two decades.

MARGARET BARNETT CRUICKSHANK¹⁰¹ (1873–1918), one of twin girls in the family of seven children of George Cruickshank, an engineer, and his wife, Elizabeth, née Taggart, was born on 1 January 1873 in Palmerston, Otago Province, about thirty miles north of Dunedin. Both her parents were immigrants from Aberdeen, Scotland. Following the early death of Elizabeth Cruickshank, Margaret's oldest sister Anne (later Steel) took on much of the responsibility of looking after the family. Margaret and her twin, Christina (see above), attended a primary school in Palmerston and then Otago Girls' High School, walking the thirty miles from Palmerston to Dunedin at the beginning and end of each term. Conscientious pupils, they shared the honor of being school *dux* in 1891.

Following the success of her high school classmate Emily Siedeberg in enrolling in the University of Otago Medical School, and encouraged by Otago Girls' High School rector Alexander Wilson, she entered the medical school in 1892. Immediately after graduating M.B.Ch.B. in 1897, she became assistant in H. C. Barclay's established practice in the small country town of Waimate, in South Canterbury, about eighty-five miles north of Dunedin. She was the first woman in New Zealand to go into private practice. At the same time she continued her formal training and received an M.D. in 1903; further periods of postgraduate study in Edinburgh and Dublin followed in the years before the First World War, as well as some traveling in Europe and America.

By 1914, when hostilities broke out, she was a full partner in the Waimate practice and superintendent of the Waimate hospital. After Barclay left to serve in the Red Cross, she took on his workload in addition to her own and was also much involved in organizing and taking part in area Red Cross activities, even bowing to the wishes of Waimate and representing the town at a Queen Carnival fund-raising event. A strong, well-built young woman, for the most part she did her rounds by bicycle, and reached her more-isolated patients by horse and gig. During the influenza epidemic she worked day and night, when the need arose undertaking such jobs as milking a family's cow to feed a hungry infant when both parents were too ill to help. Exhausted by overwork, she died of influenza on 28 November 1918 at Waimate, two months before her forty-fifth birthday; burial was at Waimate. Her skill, dependability, and patient kindness were warmly acknowledged by the people of Waimate, who erected a marble statue in her memory; surely an unprecedented tribute to a doctor in a small country town, it is also one of the few in any country honoring a woman physician.

CONSTANCE HELEN FROST¹⁰² (1862–1920), second child and eldest daughter in the family of at least eight children of Thomas Frost, a prosperous Liverpool shipowner and general merchant, and his wife, Mary Ann, née Antwis, was born on 23 June 1862, probably in Liverpool. As a child she attended a small boarding school in Sutton Coalfield, Warwickshire. About 1880, when Constance was in her late teens, the family emigrated to New Zealand, settling in the township of Onehunga; now part of Auckland, Onehunga was then the country's most important docking terminal for shipping between Britain and New Zealand.

About 1889 Constance entered Auckland University College, which had accepted women from its opening in 1883. She received a B.A. degree in 1892. A few years later she enrolled in the University of Otago Medical School and graduated M.B.Ch.B. in 1900 along with three other women, including Alice Woodward Horsley (see below); only two others, Emily Siedeberg and Margaret Cruickshank (see above), had preceded these four.

Frost was then about thirty-eight, considerably older than most of the women medical school graduates of that time. Appointments for women doctors being difficult to obtain, she accepted a post in South Australia, at Adelaide Hospital, which was then suffering from severe staffing problems. Her initial position of temporary resident for one year was extended, and in 1902 she was appointed assistant bacteriologist; for about eighteen months she had charge of the hospital's bacteriology laboratory, work that gave her considerable experience in that area.

In 1903 she returned to Auckland, established a private practice in the Mount Eden district, and was also appointed to an honorary post as bacteriologist and pathologist at Auckland Hospital; she was the second woman to hold this post, the first being Alice Woodward Horsley, who had filled it for a short time previously.

For her first ten years, Constance Frost was the only woman physician working in the hospital. The bacteriology laboratory being poorly equipped, somewhat rudimentary, and to a certain extent a hazardous place to spend much time in, it was difficult to staff; no man came forward for the post of bacteriologist, although the hospital repeatedly advertised for a male replacement for Frost. Her "temporary" honorary position, undoubtedly far from satisfactory from her point of view, was renewed annually for about fifteen years before finally being upgraded.

Acknowledged by her male colleagues as a competent bacteriologist, for a time she was fairly readily accepted and supported in her efforts to organize and improve the laboratory. However, over the years tensions arose between her and other honorary staff members. The ever-increasing use of the hospital by the community meant that her workload increased, leaving her less time for her private practice,

presumably her source of income. The appointment in 1911 of a senior resident, Charles Maquire, who disapproved of women doctors, made her situation even more difficult. By 1913, with help from Dr. Florence Keller, the only woman member of the Auckland Hospital and Charitable Aid Board, she was granted a small honorarium. Perhaps the reappointment in 1915 of Dr. Alice Woodward Horsley, now as honorary anesthetist, also helped make Frost's work environment more comfortable. In 1918 her position was upgraded to full time, with a salary of five hundred pounds per annum; but her male successor, appointed only two years later, was paid at double that rate, the second-highest salary for a member of the hospital's medical staff. This reflected not only the continuing discrimination against professional women, but also the growing recognition in the medical community of the critical importance of bacteriology, underscored by the recent influenza pandemic.

Constance Frost died at her home in Auckland, on 29 January 1920, in her fifty-eighth year, of influenza, contracted through her laboratory work. Burial was at the Purewa Cemetery, Auckland, the place of interment of several other Frost family members.

ALICE HORSLEY,¹⁰³ née WOODWARD (1871–1957), the eldest of four children of William Woodward and his wife, Laura, née Young, was born near Auckland on 3 February 1871. William Woodward was a prosperous farmer and for a time a schoolteacher; his wife was also a teacher. After attending primary school until she was thirteen, Alice was taught at home. Having made up her mind to become a doctor, she obtained extra guidance in her studies from two family friends, Dr. Scott of Onehunga, who helped her with chemistry, and a clergyman who tutored her to university entrance level in Latin. In 1894, at the age of twenty-three, she entered the University of Otago Medical School. She and three other women, including Constance Frost, graduated in 1900. Returning to Auckland, she set up a private practice, most likely with financial help from her parents, above a pharmacist's shop in Queen Street, already a major commercial thoroughfare.

Alice Woodward holds the record as the first woman physician to register in Auckland. She was also the first woman doctor on the staff of Auckland Hospital, where she was honorary bacteriologist and pathologist for the year 1901–1902, until the appointment of Constance Frost. A kindly person and a conscientious physician, she gradually built up a large general practice; most of her patients were inner-city people, and many of them were indigent, but they were never refused help because of inability to pay. Her special interests were midwifery and anesthesiology; in 1915 she was appointed honorary anesthetist at Auckland Hospital, a position she held until about 1936, when she joined the anesthesiology staff of the largely private Mater Misericordia Hospital in Auckland, the oldest of a number of Sisters of Mercy Hospitals in major New Zealand cities. Over the years she also worked privately as anesthetist with several of Auckland's prominent male surgeons.

In 1903 she married Arthur John Horsley, an apprentice pharmacist in the shop below her Queen Street consulting room. Some fourteen years later the Horsley family, in which there were four children, moved from their first home in Wellesley Street to Lower Symonds Street, a popular locality for doctors in the same general area of the city as Queen Street. Here she practiced for the rest of her life. Some domestic help and a consulting room attached to the house made her professional work possible, but, never neglecting her children, she was always extremely busy, too busy to let such details as dress take up much of her time. Her son and daughters were often to be found doing their school homework in the back of the family car while she attended a patient.

Alice Horsley's dedication to the health needs, and at times the more general needs, of Auckland's poor, especially unmarried mothers, was perhaps her greatest contribution to the community. In times of crisis she was a ready and dependable volunteer, offering help with hospital duty during the bubonic plague scare of 1900,¹⁰⁴ serving as anesthetist in the Military Hospital during the First World War, visiting patients daily at the influenza hospital during the pandemic that followed, and joining the medical relief party after the 1931 Hawke's Bay earthquake. During the economic depression of the 1930s she was the regular doctor at the nondenominational Dock Street Mission clinic, opened in 1930 to alleviate problems faced by the city's expanded population of poorer residents; during the mission's two- or three-hour clinic on Thursday evenings she would see as many as fifty patients (and occasionally fall asleep when writing prescriptions). Her reputation in Auckland's medical community was such that she was able to persuade some of Auckland's specialists to see clinic patients free of charge. Her work at the mission brought her an OBE (Officer of the Order of the British Empire) in 1939.

A well-known and admired figure in the Auckland medical community, she died at age eighty-six at Papatoetoe in southeast Auckland on 7 November 1957, after a long and productive career. She outlived her husband by seven years; her son and three daughters survived her.

HELEN STEPHEN BAIRD,¹⁰⁵ later COWIE (1875–1956), the second daughter and the third of seven surviving children in the family of James Baird and his wife, Jessie Elizabeth, née Stephen, was born at Hampden, Otago, about forty miles north of Dunedin, on 29 September 1875. James Baird was the son of a coal-mining family from Old Monkland, Lanarkshire, a few miles east of Glasgow, a region soon to become known for its heavy industry; he studied at Glasgow University in preparation for a career in the Presbyterian church but went on to divinity training at Trinity College, Glasgow, without taking an M.A. degree. On offering his services to the Free Church of Scotland Colonial Committee he was appointed to a position in the presbytery of Otago. He and his wife, the daughter of Glasgow architect John Stephen,¹⁰⁶ arrived in Dunedin on the *Robert Henderson* in 1870. A quarter of a century later all three of their sons and two of their four daughters would return to Glasgow for medical training.

In 1879, when Helen was three years old, the Rev. Baird moved from his first parish at Hampden, Otago, to the large, scattered parish of Winton-Forest Hill, a farming district about twenty miles north of Invercargill in Southland Province (figure 3.2). Helen attended a primary school in Winton and from there won a scholarship to Southland Girls' High School in Invercargill, a recently established school with a sound academic curriculum. *Dux* of the school in 1891, she went on to a B.A. course at the University of Otago, graduating in 1898.

The social concerns of her parents may well have exerted a considerable influence on Helen Baird's career choice. Having seen the devastating effects of alcohol during his early work in the slums of Glasgow, the Rev. Baird was a staunch prohibitionist; his wife, very active in parish matters, was a member of the New Zealand branch of the Women's Christian Temperance Union and much involved in charity organizations. A young woman of adventurous spirit, energetic and confident, Helen decided to study medicine, not at relatively nearby University of Otago Medical School but at Glasgow University, where her older brother William Stephen Baird had taken his M.B.Ch.M. in 1895. She was the first University of Otago woman graduate to study overseas for a second degree. She and her younger sister Annie Agnes Baird, also a University of Otago student, sailed from Southland's port of Bluff, near Invercargill, in 1898, two years after Australian-born Agnes Bennett (see below) began studies at Edinburgh University's Medical College for Women. En route to Scotland they disembarked at Marseilles and spent some time sightseeing as they traveled north through France. Their diary entries for the trip reveal their wide interests, ranging over music, literature, and the arts. At Glasgow they were welcomed by their aunt, Jessie Stephen. Both sisters entered Queen Margaret College's medical school, then the women's part of the University of Glasgow medical school. Helen was awarded an M.B.Ch.B. in 1903; Agnes received hers in 1905. As part of her training, Helen worked as a midwife in the Glasgow slums, probably not much changed since the days when her father had ministered there; after graduating she spent some time at the Glasgow Royal Infirmary while Agnes completed her degree. By then the family was well represented in Glasgow, with two younger brothers, James Henderson Baird and John Bruce Baird, also studying medicine there.

After the sisters returned to New Zealand in 1905, Agnes Baird practiced for a time in Pembroke, Wanaka, in the mountains of central Otago, where she had gone in search of a drier climate. She died of tuberculosis in 1920.¹⁰⁷ Helen, who was probably the first woman doctor in Southland, opened a general practice in Invercargill.

In 1908, at the age of thirty-two, she married James Alexander Cowie (1874–1941), a native of Winton and also of Scottish immigrant background. She had known Cowie as a fellow undergraduate at the University of Otago and later in Glasgow, where he earned an M.B.Ch.B. in 1904 and in the same year became a licentiate of the Royal College of Physicians. After the marriage they moved to Masterton in the North Island, about fifty miles northeast of Wellington (figure 3.1), where James Cowie had practiced since 1906. Joining him as an equal partner, Helen concentrated on obstetrics and anesthesiology; his area was mainly surgery, both general and gynecological. Their practice involved not only hospital work but house calls around the Masterton district. For a time, when visiting the same patient, they used an efficient and practical, though slightly unconventional, form of transportation: James drove a

motorcycle and towed Helen on her pedal cycle. Thanks to housekeeping help, she continued to work full time, although she had two children, Elizabeth, born in 1909, and Graham, born in 1911.

With the outbreak of the First World War, both Helen and James Cowie returned to Britain, where Helen worked in civilian hospitals, then short-staffed because their male doctors were serving in the military. James Cowie joined the Royal Army Medical Corps, as did two of his brothers-in-law, William Baird and John Baird.¹⁰⁸ He was made a fellow of the Royal College of Surgeons, Edinburgh, in 1915. The Cowies returned to New Zealand at the height of the influenza epidemic, and though the whole family became infected, they all recovered; at one stage Helen was the only doctor in Masterton well enough to work. Two breaks in their practice routines came in 1924 and 1934, when they again visited Britain, on these occasions spending time in London.

In 1938, three years before the death of his father, son Graham joined the family practice and Helen began to plan for retirement. However, when the Second World War began, Graham Cowie went overseas with the New Zealand Medical Corps, and Helen kept the Masterton practice going on her own. She retired as soon as her son returned in 1945.

Small and neat, always formally dressed, she was a good doctor, respected for her medical skill. She regularly attended Presbyterian church services and maintained her wide interests throughout her life; history and poetry brought particular enjoyment. She was well informed about native New Zealand trees and shrubs and kept a fine garden; antique furniture was another special interest. Incapacitated by progressive muscular atrophy during her last two years, she died in Masterton on 8 July 1956, three months before her eighty-first birthday.

JOSEPHINE GORDON RICH,¹⁰⁹ later HASWELL (fl. 1890s, early 1900s), one of four women working in New Zealand whose research is indexed in the Royal Society's *Catalogue*, was the daughter of W. Gordon Rich of Toi Tois parish, a farming region whose main town is Fortrose, about twenty-five miles southeast of Invercargill, Southland. Working with Thomas Jeffery Parker of the University of Otago, she carried out research in the university's biological laboratory on the muscle structure of the New Zealand crayfish *Palinurus edwardsii* Hutton. Rich does not appear in University of Otago student lists from the 1890s and would seem, therefore, to have been a special student of Parker's. Thomas Parker had a strong interest in crayfish studies from the 1870s, when he collaborated with Thomas Henry Huxley at London's Royal College of Science. The joint Parker-Rich work was carried out in part because Parker considered *P. edwardsii*, along with its Australian ally *P. hugelii*, to offer such convenient study types that a readily accessible account of its anatomy should be made available; at the time *Palinurus* had received little notice, if any, in standard textbooks. The resulting paper, a very detailed description of the animal's entire musculature, was read before the Otago Institute in 1892 and published the following year in the *Maclay Memorial Volume, New South Wales Linnean Society* (see bibliography).

In 1894 Josephine Rich married William Aitcheson Haswell at St. Luke's Church, Christchurch. Haswell, a former colleague of Parker's, was then Challis professor of biology at the University of Sydney; he had emigrated from Scotland to Australia for health reasons in 1878. A student of T. H. Huxley and Sir Archibald Geikie, Haswell specialized in the fauna of New South Wales coasts, especially Annelida and Bryozoa. He and Parker coauthored the two-volume *Text-book of Zoology*, published in London in 1897, a work that quickly became and long remained a standard university textbook; it ran to several editions, the fourth appearing in 1928. Although Josephine Haswell does not appear to have published any further research after her marriage, her association with academic writing and research in biology continued in the form of assistance she gave her husband in his work. She had one daughter, Mary.

Canterbury College

About 1871, two years after the University of Otago was established in Dunedin, Canterbury Collegiate Union was formed in the strongly Anglican community of Christchurch. The affiliation in 1872 of this organization with the University of New Zealand,¹¹⁰ along with the granting of a subsidy of three hundred pounds, marked the formal beginning of higher education in Canterbury Province.¹¹¹

Opened in 1872 in the rooms of the Canterbury Philosophical Institute with an initial enrollment of eighty-two, the Collegiate Union accepted women on equal terms with men, following the example of the University of Otago, which it sought to rival; much of the instruction initially offered was neces-

sarily at an elementary level. In 1874 the Collegiate Union became Canterbury College, its board of governors acquiring responsibility for several other institutions as well, among them the Canterbury Museum, where the geological work of the province was centered, and the Canterbury Public Library. By the 1880s the subjects taught covered the basic science areas (physics and mathematics, botany and zoology, geology and chemistry), but the college was very much a liberal arts institution; science classes were small and laboratory facilities essentially nonexistent. Its major impact was in the training of graduate teachers, particularly those who would hold senior posts in the new high schools founded throughout the country over a twenty-year period beginning in the late 1870s. Many of the students were older people, already teachers, and early morning, evening, and weekend classes were regularly held to accommodate them. The college also worked closely with Christchurch Normal School, but the general lack of funds led to considerable strain between the two. For the most part the students came from the lower middle classes and minor professionals, small farmers, clergy, and teachers.¹¹² By the 1880s and 1890s women outnumbered men; Canterbury College is also notable for being the first Australasian university-level institution to allow women to matriculate; the first female graduates, Anne Bolton and Helen Connon, received their B.A. degrees in 1880, five years before a woman graduated from the University of Otago.

To a large extent the institution remained a small, liberal arts college until well into the twentieth century. Very little scientific research was carried out, although from the late 1870s honors candidates in science were required to present a paper embodying investigations or other original work. The college had something of the character of a night school, but thanks to the dedication of its early faculty, academic standards were high. The best students consistently did well, going on to positions of responsibility in New Zealand and overseas, or becoming leaders in their fields.¹¹³

Many of Canterbury College's outstanding women students received their secondary education at Christchurch Girls' High School, which held its first classes in 1877, six years after the opening of Otago Girls' High School. The Christchurch school was organized and directed through its early years by Canterbury College's board of governors, which had been requested by the province's education superintendent to undertake the work of filling the gap between primary and college education for girls in Canterbury. Accommodation for the initial ninety pupils was in college buildings, but the steady increase in enrollments necessitated a move to more suitable premises within five years. Examinations were set by Canterbury College teaching staff, and academic standards were high, well up to matriculation level in the final-year classes.

Over the decade 1876–1886, following the admission of the first woman matriculated student at Canterbury College, about one-third of the student enrollment was women, and of the women entering from 1880 on, more than half received at least part of their secondary education at Christchurch Girls' High School. After graduating with B.A. degrees, a number continued studies to M.A. level, often winning first-class honors; the most popular subjects were Latin and English, although some carried out fairly advanced work in botany. With few exceptions graduates went on to teaching careers, several becoming principals of some of the country's leading girls' high schools.

Of the first two women students at Canterbury College, one, Helen Connon,¹¹⁴ taught at Christchurch Girls' High School while still an undergraduate, there joining recent Auckland College graduate Kate Edger (see Auckland College section, below). Connon became the second principal of Christchurch Girls' High School in 1883 and during her twelve years in the position did much to ensure the school's successful early development.¹¹⁵

Among the women who studied a science subject at Canterbury College before 1900 most chose botany; exceptions were two or three who studied mathematics.¹¹⁶ Two of those who studied botany, Catherine Alexander and Elsie Low, carried out student research projects that resulted in publications listed in the Royal Society's *Catalogue*.

CATHERINE ALEXANDER,¹¹⁷ later ROWE (1862–1928), was the daughter of George Alexander, a baker, and his wife, Mary Ann, née Hatch. She was born on 8 December 1862 in Kaiapoi, a small river port established in the 1840s in the mixed farming region of the northern Canterbury Plain, about twelve miles north of Christchurch. Catherine received her early education at St. Luke's Church Day School, one of the small primary schools attached to Anglican churches in Christchurch about this time; she reached matriculation standard in the 1881 university examinations, winning a Junior University

Scholarship. As a student at Canterbury College from 1882, she concentrated on English, taught by John Macmillan Brown,¹¹⁸ and botany, taught by Frederick Wollaston Hutton, professor of biology at Canterbury College from 1880 to 1893. With financial help in the form of an Exhibition Scholarship, she carried out the original work required for an honors degree in botany, most likely under the guidance of Hutton, a good general naturalist, although best known for his work in zoology and geology. Her report of her observations on the pellucid glands in the leaf and stem of the small evergreen tree or shrub *Myoporum laetum*, the Maori ngaio tree, commonly found along New Zealand's coasts as far south as Otago, was read before the Wellington Philosophical Society in 1885 and published in the *Transactions and Proceedings of the New Zealand Institute* in 1886 (see bibliography). She was awarded a B.A. with first-class honors in botany and second-class honors in English in 1885. By then she was already teaching at Christchurch Girls' High School, but her career there ended in 1886. That year, in St. Mary's Anglican Church, Addington, Christchurch, she married Thomas William Rowe, son of English immigrants to Canterbury.

For the next seven years Catherine Rowe lived in the small town of Rangiora in a farming district about twenty miles north of Christchurch, where her husband had accepted the position of principal in the recently established Rangiora High School. For a time Catherine was assistant mistress at this school, in charge of the younger pupils, with Thomas Rowe bringing the upper three forms to university entrance standard in all subjects, including Latin and mathematics. Energetic and enthusiastic, the Rowes played a prominent part in Rangiora intellectual and cultural life, especially in the very popular and active Literary and Debating Society, of which Thomas Rowe was secretary. In 1893 they moved to Wellington, following Rowe's appointment as the first city librarian at the public library opened that year by Wellington City Council. Some time after 1904 the family, which included four children, returned to Christchurch. Thomas Rowe took a law degree at Canterbury College School of Law in 1906, qualifying as a solicitor. He was appointed assistant lecturer in the School of Law in 1912 and served as head of the department from 1922 until his death in 1928. Catherine died at the age of sixty-five, at her home in Christchurch, on 17 March 1928, a few weeks after her husband.

ELSIE LOW,¹¹⁹ later DOHRMANN (1875–1909), was the youngest daughter among the five children of Benjamin Low and his wife, Sabine Susanna, née Harris. Elsie was born on 25 July 1875 at Horndon on the Hill, Essex, where the Lows kept a general store. The family went to New Zealand as assisted immigrants in 1876, settling in the Ashburton district, about sixty miles southwest of Christchurch, a region recently opened for mixed farming. Benjamin Low immediately became the first schoolmaster in the community of Willoby while also, along with his wife, beginning studies for the basic teaching certificate; they both qualified in 1881. Benjamin Low continued to teach at Willoby for twenty-one years, his wife serving as an assistant teacher for most of the time.

Elsie Low probably attended the Willoby school, which provided a sound elementary education in a lively atmosphere; in 1888, when she was thirteen, she won a three-year scholarship to Ashburton High School, the only one of the Low children to do so. Additional scholarships allowed her to attend Christchurch Girls' High School for a further three years (1891–1894). Here she was strongly influenced by Helen Connon Brown,¹²⁰ who encouraged her to compete for a university scholarship in 1894; she ranked fourth in the country and entered Canterbury College that year. Her interests centered on the natural sciences, particularly botany, and she won a number of additional scholarships, including a senior scholarship, for work in that area. Following the award of a B.A. in 1897, she continued her studies, carrying out research required for an honors M.A. degree in the college's biological department, then led by Arthur Dendy, a graduate of the University of Manchester. Well respected for his wide-ranging work in both zoology and botany, Dendy was an inspiring teacher and a popular lecturer who did much to invigorate the department.¹²¹

The work she undertook involved an examination of the vegetative organs of the remarkable plant *Haastia pulvinaris*, commonly known by its popular name, vegetable sheep. Perennial, low-growing, shaped like a somewhat flattened cushion and capable of growing as large as a sofa, *H. pulvinaris* has two forms; Elsie Low studied the greenish-gray form. A genus endemic to New Zealand, *Haastia* occurs as three species, all strictly alpine.¹²² Before Low's investigation, the only other botanical description of *Haastia* was in Joseph Hooker's classic *Handbook of New Zealand Flora* (1864–1867). Her

detailed anatomical report of stem, root, and leaf was followed by a discussion of the plant's habitat and its method of adapting to its extreme environment on the shingle slips of the high alps at altitudes of five thousand to six thousand feet in New Zealand's South Island. The paper, published in the *Transactions of the New Zealand Institute* in 1899, was read before the Canterbury Philosophical Institute that year by Dendy, who explained that it was first prepared in 1897 but the manuscript and illustrations were lost in 1898 when the New Zealand Shipping Company's steamship *Mataura* was wrecked in the Straits of Magellan en route to Britain;¹²³ Low rewrote the paper in 1898. Dendy also stated that an account of the leaf structure of *H. pulvinaris*, unavailable to Elsie Low at the time of her research, had been published in Europe in 1896.¹²⁴

Declining the offer of a second-class honors degree in English, French, botany, and biology following the loss of her examination papers, she taught for a year at Waimate District High School. She then retook the examinations and in 1899 was awarded her degree with first-class honors in English and French and second-class honors in botany. One might wonder if the decision to award her second-class in botany was in any way influenced by the 1896 publication in Europe of the work on *H. pulvinaris* leaf structure, a possibility that emphasizes the special difficulties then faced by workers in regions distant from western centers.

Elsie taught and also served as house mistress at Napier Girls' High School, in Napier, North Island, in 1899 and then returned to Christchurch Girls' High School, where she was a well-liked and much-respected teacher during the three years she stayed there. Her professional career ended in 1903 when she married Henry Dohrmann, a Christchurch man, son of immigrants from Hanover, who was then farming at Studholme Junction, near Waimate, the town where physician Margaret Cruickshank (see above) was then practicing. Her daughter Adelheit Susanna was born in 1905.

Elsie's energy and initiative now found other outlets. Deeply religious, with strong rural-Methodist roots, she was a confident public speaker and a competent writer, as well as being an able organizer. She quickly became a prominent figure in Waimate, especially in the local branch of the Women's Christian Temperance Union, one of the influential social organizations of the time. For several years she wrote an unsigned temperance column for the *Waimate Times*, and she frequently spoke at public gatherings, often in fairly distant places. President of the Waimate branch of the Women's Christian Temperance Union from about 1906 until her death, she was national treasurer in 1906–1907 and national corresponding secretary in 1907–1908. For a short time she also served as superintendent of the union's Department of Non-Alcoholic Medication, a group organized to stop doctors from prescribing alcohol for medicinal purposes. Somewhat weakened during childhood by attacks of rheumatic fever, she suffered illnesses that interrupted her social work more and more. She died in Waimate on 14 February 1909 at the age of thirty-four.

Two more early women graduates of Canterbury College, MARGARET FLORENCE LOUISA OLLIVER and PHOEBE MYERS, are also of interest.

Olliver was probably the first woman to receive a B.Sc. (1905) and an M.Sc. at Canterbury College, following her M.A. with honors in natural science (1899).

Myers was awarded a B.A. in 1890 and later worked as a demonstrator in biology at Victoria College, Wellington, thus being one of the few women in New Zealand teaching a science at college level at that time. Born in Nelson, she attended Motueka and Thorndon schools and Wellington Girls' College before entering Canterbury College in 1885. After graduating she taught for almost four decades in schools in the Wellington area, while also holding the demonstratorship in biology at Victoria College in the period 1906–1912. During these years she was prominent in a number of educational and social service organizations, serving on the Council of Education (1915–1920), as president of the New Zealand Women Teachers' Association (1914–1916), and as a member of the Wellington Free Kindergarten Association (1916–1921). She also published articles on education in New Zealand newspapers. Later, in the 1920s in England, she lectured to Women's Institutes on the subject of women's lives in New Zealand, working under the auspices of the Victorian League, an organization to promote cooperation and understanding within the countries of what was then the British Empire.¹²⁵

Of the women who studied at Canterbury College before 1900, three qualified as physicians: Aimée Mills, Alice Moorhouse, and Mary Alice Blair. Brief notes on the short medical careers of Mills and Moorhouse and the lengthier professional life of Blair are offered below.

AIMÉE EVELINE MILLS,¹²⁶ later GIBBS (fl. 1880s–1920s), the earliest of these three, was born in Nelson province and attended West Christchurch School and Christchurch Girls' High School before entering Canterbury College in 1885. While still a student and for ten years after graduating (B.A., 1888; M.A., honors Latin and English, 1889) she taught at Christchurch Girls' High School, but in 1900 she changed course and started medical studies at the University of Otago Medical School. Transferring to Edinburgh in 1901, she completed her training there and graduated M.B.Ch.B. from the University of Edinburgh in 1904. She then held a succession of resident physician positions in hospitals in London, Dublin, and Leith but appears to have given up medical work following her marriage in 1906 to Edinburgh surgeon John Herbert Gibbs. She had one son. Always a strong supporter of higher education for women and women's rights, she became prominent in the women's movement in Edinburgh.

ALICE MOORHOUSE,¹²⁷ later MORELAND (fl. 1890s–1920s), also received her medical training in Scotland. Following early studies at Canterbury College, which she entered in 1895, she enrolled at Queen Margaret College, the University of Glasgow, and received an M.B.Ch.B. in 1901. After returning to New Zealand, she was medical officer at Hanmer Springs Sanatorium in the alpine village of Hanmer, north of Christchurch, and then at St. Helen's Maternity Hospital, Christchurch. One of the few women members of the Philosophical Institute of Canterbury in the early 1900s, she married another of the group's members, the Rev. C. H. Moreland. At least by the late 1920s she had retired from medical work.

MARY ALICE BLAIR,¹²⁸ (fl. 1890s–1920s), who was born in Dunedin, attended Wellington Girls' College before entering Canterbury College in 1898. The following year she studied at newly opened Victoria College, Wellington, but then transferred to Auckland University College, which awarded her a B.Sc. in 1902. Having decided to take up medical studies, she went to Britain and entered the London School of Medicine for Women; she qualified (B.S., M.B., University of London) in 1907. From then on, for more than twenty years, she worked in maternity and children's departments in a succession of London hospitals, such as the Royal Free Hospital, where from 1908 to 1911 she was assistant anesthetist, house surgeon, and senior obstetric assistant. In addition she conducted a private practice, first in Kensington and then in Westminster, and also carried out lecturing assignments and Civil Service Commission work. The First World War brought an interruption of several years to this pattern of work. In 1915–1916 Mary Blair served as medical officer at the Scottish Women's Hospital, Ajaccio, Corsica, and from 1916 to 1918 she was attached to the Royal Army Medical Corps in Malta and Salonika; her contributions to the military effort were mentioned in dispatches. For a short period after the armistice, she held the position of senior medical officer at Queen Mary's Army Auxiliary Corps Hospital, London. She appears to have stayed in London and continued her medical work at least until the late 1920s.

In Christchurch as elsewhere the coming of the First World War opened opportunities for women in scientific work and university teaching. Therefore, as something of a postscript to this sketch of late nineteenth-century women graduates with interests in the sciences, short notes on three of the first Canterbury College women graduates to hold lectureships in a scientific field are added here; these women were Bella Cross, Elizabeth Herriott, and Flora Murray. All three carried out research, and two, Cross and Herriott, each published a number of technical reports in scientific journals.

BELLA DYTES MACINTOSH CROSS,¹²⁹ later JENNINGS, and then MACCALLUM (1885?–1927), was born in the coastal town of Timaru about ninety miles southwest of Christchurch; before entering Canterbury College in 1905, she attended Timaru Girls' High School and Christchurch Training College. An outstanding student as well as a fine athlete, she held a demonstratorship in biology at Canterbury College while still an undergraduate. She received a B.A. in 1908, along with a senior scholarship in botany, and an M.A. with first-class honors in botany in 1909.

Bella Cross's paper read before the Canterbury Philosophical Institute in 1909 reported her M.A. research on some common South Island halophytes, plant species that have adapted morphologically and anatomically to life in salty soils near the sea, such as salt marshes and brackish water areas. At that time little detailed botanical work had been done on New Zealand halophyte species; Bella Cross compared typical formations around Christchurch with similar formations near Timaru, her work consisting of both field observations and anatomical studies in the laboratory. Her lengthy account constituted a significant contribution toward opening up this section of New Zealand plant studies.¹³⁰

Awarded a National Research Scholarship for 1909–1911, she continued work on wetland plants with a study of another New Zealand group, the genus *Phormium*, commonly known as New Zealand flax—colorful, decorative plants, with long, sword-shaped leaves containing strong fibers and tall flower stalks, whose bright-red blossoms produce large quantities of nectar. Although known since the time of James Cook and Joseph Banks and recognized as very important economically, *Phormium* still awaited a rigorous botanical investigation. Her comprehensive dissertation, deposited in the Dominion Museum, Wellington, and presented in shortened form to the Philosophical Institute of Canterbury in 1914, included her proposed species and variety classification (then undecided) and detailed descriptions of the vegetative and floristic characteristics of the many varieties, plus notes on pollination, development, and the main fungal diseases affecting the plants. She also presented a short historical account of the important flax industry from Maori times and a section on its current state. The two species generally accepted, *P. tenex* and *P. cookianum*, (harakeke and wharariki respectively in Maori) are now widely distributed through the temperate regions and used as ornamental plants as well as sources of fiber.¹³¹ She was awarded a University of New Zealand D.Sc. in 1919, following the presentation of her thesis entitled “*Phormium* with regard to its economic importance.”

From 1912, for two or three years until the outbreak of the First World War, she held assistantships at, successively, St. Margaret’s College, Christchurch, and New Plymouth High School. About this time (1914?) she married fellow Canterbury College graduate and fellow tennis champion Launcelot Shadwell Jennings, a zoologist who in 1912 served as acting head of the biological department. In 1915 Jennings joined the Otago Infantry Battalion of the New Zealand Expeditionary Force and sailed for Europe; he was killed in action in 1916. Bella went over the research materials he had left and prepared for publication his notes on the marine crustacean group *Cirripedia*, of which the New Zealand species had received little attention.¹³² For a short time she returned to Timaru, but in 1919 she remarried, her second husband being Peter MacCallum (1885–1974), also a Canterbury College graduate and outstanding athlete, who had taken an M.B.Ch.B. degree at the University of Edinburgh (1914) and served with great distinction in the Royal Army Medical Corps throughout the war years. The marriage took place in St. Giles’ Church, Edinburgh, on 25 August 1919, Bella having accompanied MacCallum back to Britain following his period of home leave earlier that year. After taking a short course in bacteriology at Cambridge Medical School, she moved to Edinburgh to join MacCallum, who had been appointed lecturer in pathology at the University of Edinburgh and clinical pathologist at the Royal Infirmary.

Bella MacCallum’s last research was her study of fungi that cause economically significant dark-gray or black stains on newly harvested lumber, work carried out at the mycology department, University of Edinburgh. She was one of the early workers in the complex field of fungus identification who emphasized the role of fungus-vector combinations. In the case she was studying, the main species involved, including several of the genus *Ceratostomella*, are associated with the beetle vector, *Tomicus piniperda*, the fungus-vector combination being capable of killing already stressed pines. The disease was then common throughout Scotland, with the woodlands around Edinburgh being no exception. Her 1922 paper, a short account of the life history of *Ceratostomella piceae* Münch, reported slow, difficult work involving attempts at single spore cultivation, which she hoped to develop later when more research time was available.¹³³ In 1920–1921 she acted as assistant in Edinburgh University’s botany department.

The MacCallums moved to Australia in 1924, Peter MacCallum having accepted the position of chair of pathology at the University of Melbourne. They had three daughters. Bella died in 1927 when she was about forty-two. A woman of remarkable energy and vitality living in a world of widespread upheaval and change, she had a full and eventful, if regrettably short life; her impressively wide sphere of activity embraced championship athletics and scholarly research in a scientific field as well as family life. Her contributions to botanical knowledge, though slight, were worthy in that she undertook basic studies on previously neglected subjects. She was elected a fellow of the Linnean Society in 1921.

ELIZABETH MAUDE HERRIOTT¹³⁴ was born in 1882 in Rangiora, about twenty miles north of Christchurch, and received her early education in Christchurch, first at East Christchurch School and then at Christchurch Girls’ High School. She entered Canterbury College with a Junior University Scholarship in 1900. Winner of exhibition scholarships in chemistry and botany in 1902, she was awarded a B.A. in 1904 and an M.A. in botany in 1905.

She then taught for about seven years, first for a short period in private schools in Christchurch and then in Kaikoura District School, Marlborough Region, some one hundred miles north of Christchurch. In 1916 she was appointed assistant lecturer in the biological department of Canterbury College, replacing assistant lecturer Charles Foweraker, who had left for military service. In 1919, staff shortages continuing, she was offered and accepted a formal appointment as assistant lecturer in biology. Two years later, when Charles Chilton became rector of the college as well as head of the biological department, she became his special assistant, as well as continuing her assistant lectureship, a rearrangement in the biological department that required the appointment of a second lecturer, Flora Murray (see below), as part-time assistant.

Between 1906 and 1923 Elizabeth Herriott published four technical papers, three of them on collections at the biological department, the fourth a historical account documenting the changes in the floral population of Hagley Park, Christchurch, over the seventy-year period of European settlement in the region. The bulk of her research was probably carried out before 1920, most of it under the general guidance of Charles Chilton. She was a member of the Philosophical Institute of Canterbury for many years, was elected to its council in 1919, and served as honorary librarian in the early 1920s.

In her first paper, a report of her research to fulfill the M.A. degree requirements, she presented her anatomical study of the leaf structure of a number of plants from New Zealand's Subantarctic Islands (figure 3.3), the flora of these isolated, rarely visited island groups off the southeastern coast of New Zealand being of special interest botanically.¹³⁵ Herriott's materials were a selection of the plants collected in 1903 by botanist Leonard Cockayne, brought back live and established close to the college's biological laboratory. Isolation, particular climatic conditions, and the absence of herbivorous predators on these small islands led to the evolution of a remarkably rich, diverse, and distinctive plant population, which was still relatively undisturbed in the early 1900s. A special feature is the group of herbaceous perennials known as megaherbs, characterized by their very large leaves and often unusually colored flowers, which in season produce a magnificent display. Herriott studied the leaf structure of twenty-nine species more fully than had been done previously, her purpose being to demonstrate more precisely how the plants had adapted to their peculiar environmental conditions. Among those she examined were three especially striking species: *Stilbocarpa polaris*, the Macquarie Island Cabbage, with its fluted, rhubarblike leaves, found on all the island groups; the extraordinary *Pleurophyllum speciosum*, the Campbell Island daisy, which forms an enormous rosette, up to four feet across, of very large, broad, pleated leaves and is well represented in the Auckland Group and Campbell Island; and the tree daisy, *Olearia lyalii*, notable for its whitish leaves, a tree fern found only on the Snares Islands, the southern limit for tree ferns. Her reports for each of the twenty-nine species she investigated presented her studies of transverse leaf sections, together with general descriptions and information about habitat and locality drawn extensively from the publications of Cockayne, Kirk, and other workers.¹³⁶

When she returned to Canterbury College's biological department as assistant lecturer in 1916, she quickly resumed research, beginning with a study of a small, freshwater crustacean of the genus *Lepidurus*, widely distributed throughout Australia and New Zealand and sometimes found after spring rains in gravel and shingle pits around Christchurch. Earlier workers had raised the question of whether the many reported species of *Lepidurus* might in fact be varieties of one widespread species, *Lepidurus viridis* (the shield shrimp). She studied two collections she kept for two or three weeks in the laboratory during the spring of 1916, observing characteristics such as size and color variation, eating habits, length of carapace, and length of caudal setae; she concluded that her study bore out the suggestion that the number of species of *Lepidurus* (recognized in 2008 to be twenty-one) should be reduced.¹³⁷

Her discussion of the botanical history of the area on the west side of Christchurch known as Hagley Park traced the changes in the native plant population from its undisturbed state to the early twentieth century, as far as this could be done by examination of the existing documents.¹³⁸ The two key plant lists she used, both unpublished previously, allowed a comparison of the flora observed in 1864 with that observed in 1918. These were supplemented with notes in early books, articles in the *Littleton Times* newspaper, minutes of governing board meetings, and one or two partial lists from about 1905. She also gave brief accounts of the park's soil type (sandy loam with areas of swamp) and such matters as the early planting of nonnative, later "historic" trees by visiting royalty; in addition she followed the effects of grazing animals, along with the introduction of fodder grasses. Swamp drainage was espe-

cially destructive from a botanical standpoint; the drainage to form five-acre Victoria Lake in 1897 to commemorate the Queen's diamond jubilee wiped out a great many native plants.

The list from 1864 that Herriott used consisted of eighty-eight species observed in the park and the area designated the Domain (Botanic Gardens) by botanist Joseph Armstrong; these were mainly herbaceous plants and ferns, plus six species of shrubs. Armstrong, who along with his father, government gardener John Armstrong, did much to reintroduce native plants to the park, for long had charge of the park's nursery department; the two areas he noted as richest in New Zealand plants were the swamp destroyed by the formation of Victoria Lake and a stretch of sandy ground taken over for part of the International Exhibition of 1906–1907. The 1918 list, prepared by Arnold Wall,¹³⁹ amateur botanist and professor of English and history at Canterbury College, enumerated only eighteen species of surviving New Zealand plants, and many of these were represented by only a few specimens or were judged to be close to extinction. However discouraging the picture she presented might seem, all was not lost; it had already been suggested that part of the park be enclosed, introduced weeds removed, and native plants originally growing there reestablished.

In 1921, before teaching and clerical duties would seem to have occupied all her time, Elizabeth Herriott concluded her studies of plants of New Zealand and those of the Subantarctic Islands that had evolved unusual anatomical and morphological characteristics to suit their harsh environment. Her notes on the brown bull kelp *Durvillea antarctica* (Cham.) Hariot were read before the Philosophical Institute of Canterbury that year and published in 1923.¹⁴⁰

A massive plant, of widespread circumpolar distribution, *D. antarctica* is common around the coasts of New Zealand and the southern islands, where it is found attached to rocks in huge banks where the surf is very violent; it had not previously been studied by a New Zealand botanist. Herriott carried out microscopic examinations of cell structure in the three main parts: the elastic holdfast, which attaches the plant to its rock base; the stipe (stem); and the blades, with their whiplike segments often several yards long. (The distinctive honeycomb internal structure of the latter, which she regarded as accommodating air chambers, has since been reinterpreted.) *D. antarctica* is used as a food in Chile and is now also a raw material in the cosmetics industry.

Elizabeth Herriott was promoted to lecturer in 1928 and held that position until 1934, when, at the age of fifty-two, she appears to have left the college.

Little information has been found about FLORA BUCHAN MURRAY¹⁴¹ (b. 1897?), who joined the staff of Canterbury College as assistant lecturer in 1922. She was born in Carterton, a small town about thirty miles northeast of Wellington, probably about 1897. After attending various primary schools and then Christchurch Girls' High School, she enrolled at Canterbury College in 1915. Winner of the prize in zoology in 1916–1917, she was awarded a B.A. in 1920 and an M.A. with first-class honors in botany in 1921. She then taught for a short time in Rangī-ruru Girls' School, Christchurch, but in 1922 became a research assistant in the School of Forestry at Canterbury College and a part-time lecturer in the biology department. She does not appear to have brought out any technical publications. Her membership in the Philosophical Institute of Canterbury continued at least through the 1920s.

Auckland University College

Auckland University College, formally opened in 1883, had its roots in the boys' school, Auckland Grammar School, which dates back to 1869. Because of the connections between the boys' school and the first of the important state-supported secondary schools for girls in Auckland, Auckland Girls' Grammar School, some preliminary general remarks about the development of Auckland's early schools are included here.

Overall, compared to Otago and Canterbury, Auckland Province lagged somewhat in establishing public, postelementary education, although in the matter of providing some academically sound, state-supported education for girls it was not far behind Dunedin and Christchurch; the predecessor of Auckland Girls' Grammar School (Auckland Girls' High School) opened in 1877, the same year as Christchurch Girls' High School and only six years after Otago Girls' High School. In part the slower development of public education in Auckland arose from the relative poverty of Auckland Provincial Council. Having neither a staple export equivalent to the South Island's wool nor wealth like that

derived from the Otago goldfields, authorities were reluctant to invest the meager resources available to them in education. Social factors also came into play. In contrast to the fairly well-defined national backgrounds and religious characteristics of Scottish Presbyterian Dunedin and Anglican Christchurch, Auckland's settlers of the 1840s came from all parts of the British Isles; the traditional emphasis on education that the nineteenth-century Scots brought to Otago and the rivalry that spurred Canterbury to compete were absent in Auckland. By about 1870 gold discoveries in the Thames region and the Coromandel Peninsula began to ease Auckland's financial position, but money for public education remained scarce.¹⁴²

Auckland's earliest schools were private "academies," often run by widowed ladies; a few public schools provided basic instruction in reading, writing, and arithmetic, and church schools, including a Church of England Grammar School, offered secondary education for boys. By 1869 sufficient public education funds had accumulated to permit the opening of Auckland Grammar School, the money coming from a Crown land grant given in 1850 by Governor Sir George Gray as an endowment for the support of a college and grammar school, or schools, in Auckland. Starting with an initial roll of sixty-eight boys age ten and older, the grammar school's numbers rose steadily. In 1872, not long after the passage of the New Zealand University Act, which made possible the affiliation of any college or educational establishment in the country with the University of New Zealand, Auckland Grammar School changed its name to Auckland College and Grammar School and affiliated.¹⁴³

The idea of a state-supported secondary school for girls was also put forward about this time, the effort being led in part by Sarah Sophia Stothard (1825/26?–1901), a London educationalist who had come to Auckland in 1860 with the Church Missionary Society. Stothard had an English teachers' certificate and several years of experience in teaching and teacher training before she emigrated.¹⁴⁴ Her attempts to persuade the Auckland Board of Education to establish a college and grammar school for girls met with no success, but a subsequent effort, led by Frances Shayle George, resulted in the opening of Auckland Girls' High School in 1877.¹⁴⁵ Sophia Stothard, who had meantime moved to a teaching post in Christchurch, was invited to be the school's first principal. Starting with about sixty girls and a training class of perhaps five young women, she had a difficult time; an influx of more pupils, many with insufficient grounding, added to problems arising from inadequate premises, poor equipment, and meager funding. Relations between Stothard and the board of education became strained, and she resigned within a year. Her successor was Neil Heath, from the teaching staff of Auckland College and Grammar School. Heath led Auckland Girls' High School for the next six years, adjusted the organization, and improved the syllabuses. He was followed by John Sloman, another Auckland College and Grammar School teacher, who served as headmaster until 1888, when Auckland Girls' High School was reorganized and renamed Auckland Girls' Grammar School.

This girls' high school occupied classrooms in the premises of the boys' school, Auckland Grammar School, which itself dated from 1883, when its immediate predecessor, Auckland College and Grammar School, was reorganized as two separate institutions, a secondary school and Auckland University College. Although housed on the same site and following the same curriculum, the boys' and girls' schools were very much separate. Elaborate precautions to keep the two groups apart included separate entrances and a fourteen-foot wall across the playground; strict instructions from the board of governors stipulated that no female teachers were to teach male pupils.

The first woman to be awarded a University of New Zealand degree, Kate Edger, who was also the second woman university graduate in the British Empire,¹⁴⁶ also has the distinction of being the first, and indeed the only, female to attend classes at Auckland College and Grammar School.

KATE MILLIGAN EDGER,¹⁴⁷ later EVANS (1857–1935), the third daughter in the family of four girls and one boy of Rev. Samuel Edger (1823–1882), a Baptist minister, and his wife, Louisa, née Harwood, was born on 6 January 1857 in Abington, Berkshire, about six miles south of Oxford. The Edgers emigrated to New Zealand in 1862 following Samuel Edger's appointment as minister to accompany emigrants to the Albertland settlement in Northland, north of Auckland. Later they moved to Auckland, where Samuel conducted nonsectarian services for many years.

Kate and her sisters were given their earliest education at home by their father. Following his advice, Kate applied to the University of New Zealand for permission to compete for a university mathematical scholarship, stating her qualifications but not her sex. The university senate, feeling that a refusal would

cause more trouble than allowing her to proceed, granted her application. With her father's help she also obtained permission from the headmaster of Auckland College and Grammar School to study with the boys' senior class; since the school was by then affiliated with the University of New Zealand, this gave her the opportunity to begin work leading toward a degree. There is no record of the presence of the sole girl in the class causing significant disruption to the functioning of the school. Kate was one of two Auckland College and Grammar School pupils to win scholarships in 1874. Three years later she received a University of New Zealand B.A. degree, with a concentration in mathematics and Latin, two subjects long considered beyond the capabilities of most female minds. A crowd of almost one thousand came to watch the Auckland graduation ceremonies that year.

Her first teaching post was at Christchurch Girls' High School, where she joined the staff the year the school opened (1877). While in Christchurch she studied for an M.A. degree at Canterbury College, where her sister Lilian¹⁴⁸ and one of her fellow high school teachers, Helen Connon,¹⁴⁹ were also students. In 1879 she, along with Helen Connon and five other women, joined the Philosophical Institute of Canterbury; Kate maintained her membership for five years, although the others, including Helen Connon, dropped out fairly quickly.¹⁵⁰ Both the Edger sisters received M.A. degrees in 1882.

Shortly thereafter Kate was appointed principal of Nelson College for Girls, a new school to be opened in February 1883. Then twenty-six, with five years of teaching experience behind her, she took on the job of welding together a functioning unit of teachers and children with all the complexities of boarding-school life. Initially her work involved supervising the boarders—not a task she enjoyed—and dealing with problems caused by poorly designed buildings; when the school council of governors could not afford to provide equipment, she bought it out of her own salary. As well as the administrative work of headmistress, she carried a considerable teaching load, which included English, Latin, and physical science classes; in addition she prepared the school's most promising pupils for university scholarship examinations. In their free time she and her sister Lilian, one of the school staff members in 1883–1884, edited two volumes of the lectures and writings of their father, who had died in 1882.¹⁵¹

An admired and respected teacher, well liked by her pupils, Kate Edger did much to establish Nelson College for Girls as a school that provided first-class secondary education. In 1890 she married Welsh Congregational minister William Albert Evans, who had arrived in Nelson the previous year. She resigned her post soon after and from then on gave her energies to family concerns and matters relating to her husband's church.

In 1893 the Evans family moved to Wellington, where William Evans became very active in the Forward Movement, an organization that combined adult education with charitable and philanthropic activities. Kate joined in, working among the city's poor and sometimes presenting lectures on behalf of the movement. Since her husband was fully engaged with his unpaid work, she undertook the financial support of the family, which now included three sons. During the late 1890s and early 1900s she conducted a private secondary school for girls in the morning and coached adult students in the evening, all her teaching being done in the family home in the Mount Victoria district. William Evans's appointment in 1904 to the charge of the Congregational church in the Newtown suburb of Wellington, then a working-class district in the south of the city, helped ease some of the financial strain, but Kate continued her coaching until at least 1912. She was also a member of the Newtown school committee.

Like her sister Lilian, Kate Edger was for many years active in a wide range of academic concerns. Over a period of several decades, beginning in 1891, she worked on occasion as a university entrance examiner, and for two years during the First World War she was employed by the Department of Education. Although devoted to her family, she avoided housework as much as possible. The position of women in the life of the nation was a major interest; she was much involved in the campaign for women's suffrage in New Zealand, presiding over meetings and delivering speeches on behalf of the cause.¹⁵² President and vice president of the Wellington branch of the New Zealand Society for the Protection of Women and Children from 1897 until about 1928, she was also dominion secretary of the League of Nations Union of New Zealand and secretary of its Wellington branch. Until the early 1930s she was active in the Women's Christian Temperance Union, for a time serving as associate editor of its journal, the *White Ribbon*. In 1923, when Canterbury University College marked its golden jubilee, Kate led the women graduates section in the procession through the streets of Christchurch.

After her husband's death in 1921 she continued to live in Wellington for several years, but in 1932 she moved to Dunedin to live with her second son, Elwyn, and his family. In 1933 she traveled to Nelson to attend the golden jubilee celebrations of Nelson College for Girls. Her pioneering work in women's education in New Zealand and her years of public service in several areas were recognized in 1935 when she received the King's Silver Jubilee Medal. She died in Dunedin on 6 May 1935 at the age of seventy-eight.

A short sketch of the work of one other early woman student at Auckland University College, Annie Whitelaw, is included here. Later a prominent figure in the development of women's education, Whitelaw is also of interest because of her close association with Auckland Girls' Grammar School in its early days; she was a foundation pupil at the school when it opened at its first site, that shared with Auckland Boys' Grammar School, and its first headmistress after it moved to a new building in 1906.

ANNIE WATT WHITELAW¹⁵³ (1875–1966), one of the twelve children of George Whitelaw and his wife, Grace, née Hutton, was born on 15 August 1875 at 35 Dundas Street, Edinburgh. George Whitelaw was an accountant and treasurer of the synod of the United Presbyterian Church. Both he and his wife came originally from Perth, but the family lived in Glasgow until George decided to emigrate to New Zealand in 1878. Annie, her mother, and two of her siblings joined him early the following year, the rest of the children arriving soon afterward.

The Whitelaws settled in a large house in the Ponsonby district of Auckland. Annie, a bright child, attended the local primary school and then Auckland Girls' High School. The reorganization of this school in 1888 into Auckland Girls' Grammar School meant that Annie became one of the latter's first pupils. During her four years there she did especially well in mathematics and in 1890 won a Junior University Scholarship, placing thirty-seventh in New Zealand. Despite the premature death of her father in 1888, she was able to continue her education; in 1893 she completed her medical preliminary year at Auckland University College.

She did not pursue medical training but, after considering piano studies in Germany, went instead in 1894 to Girton College, Cambridge, where she concentrated on mathematics. It is possible that this decision was influenced by William Steadman Aldis, a Cambridge graduate who was professor of mathematics at Auckland University College from 1884. Both Aldis and his wife, Mary, were outspoken supporters of women's right to higher education, and in addition Mary Aldis had contacts with educationalist Emily Davies of Girton College.¹⁵⁴ The mid-1890s were eventful times for women students at Cambridge; memories were still strong of the outstanding achievements in the mathematical tripos of Philippa Fawcett in 1890 and Grace Chisholm two years later.¹⁵⁵ Annie Whitelaw passed the mathematical tripos examinations in 1897, gaining class II in part I.

She began her teaching career the following year when she joined the staff of newly opened Wycombe Abbey School, an independent school for girls in High Wycombe, Buckinghamshire, headed by Frances Dove, who had been educated at Girton College.¹⁵⁶ Housed in a fine old gothic-style manor house surrounded by 160 acres of woods and gardens in the Chiltern Hills uplands, Wycombe Abbey School aspired to high academic standards. Whitelaw, who taught mathematics, soon developed close friendships with other former Girton College students on the school staff. In July 1905 she and Frances Dove received M.A. degrees from Trinity College, Dublin, which between 1904 and 1907 granted both B.A. and M.A. degrees to students of the Oxford and Cambridge women's colleges who had successfully completed their examinations.

In 1906, when the board of governors separated the Auckland Grammar School complex into two parts, Annie Whitelaw was offered the position of headmistress of the girls' part, the Girls' High School, now renamed Auckland Girls' Grammar School. On her return to New Zealand she found the promised new building not yet completed. Conditions were difficult for her first two years, but academic standards, particularly in mathematics, compared favorably with those she had found in England. Although her stay as headmistress was short, her forceful leadership was of great value to the school during the critical first period of its separate existence. Her ties to Wycombe Abbey had by no means loosened, however, and in 1910, following the retirement of Frances Dove, she accepted the invitation of the school council to become headmistress and returned to England.

As Wycombe Abbey School's second headmistress, Annie Whitelaw worked to mold the school into a closely knit community. The school council supported her building projects, which included

a school chapel. Deeply religious and a confirmed Anglican, over the years she came to place more and more emphasis on religion and community service in the life of the school. By the early 1920s her drive in this direction appears to have reached the point of putting the school's academic standards at risk, a situation that led to tension between her and the school's council and inspectors.¹⁵⁷ She resigned in 1925.

She was then fifty, at the height of her powers, with two decades of administrative experience and secondary school teaching behind her. Embarking on what in many respects was a second career, from then on she gave her considerable energy to the broader cause of women's welfare, in particular the education of girls and women provided through voluntary and church mission organizations. Appointed to a Colonial Office committee on native education, she spent six months in 1925–1926 inspecting schools and colleges in British colonies in Africa. Her reports to the African education group included notes and memoranda on improving the quality of education for girls in Uganda and Tanganyika Territory.¹⁵⁸ On her return, eager to increase the supply of qualified women teachers, she obtained the post of director of women's education at the Selly Oak Missionary Colleges near Birmingham.¹⁵⁹ Here once again she found herself in a position where her ideas about appropriate education were somewhat at odds with those of the institution's administrators. She resigned after four years, her position on the Colonial Office advisory committee also having come to an end. Her last five years in Britain were spent in voluntary work as warden of Talbot Settlement, an Anglican women's mission working in the Camberwell district of the London borough of Southwark. Her contacts with mission and social service work in Camberwell were already well established, going back to her days as headmistress of Wycombe Abbey School; thanks to her continuing close ties with Wycombe Abbey former pupils, she was very successful in rescuing the settlement from its considerable financial difficulties.

She returned to Auckland in 1938 and took up residence with her sister Edith in the city's Remuera district. She renewed contacts with Auckland Girls' Grammar School and joined the congregation of St. Mark's Church, Remuera. She was also active in the New Zealand Federation of University Women, holding office as vice president of its Auckland branch in 1938, 1939, and 1944. In 1941 she was a member of a commission that examined Maori educational work carried out by the Anglican Church. While serving on the board of directors of the YWCA during the Second World War years, she chaired a committee responsible for establishing a library for members of the armed forces. In 1948 and 1953, by then in her seventies, she made two extended visits to England, after which she lived alone in her Remuera home, looked after by various members of her extended family. She died there on 11 August 1966, four days before her ninety-first birthday, of pulmonary edema; burial was at Purewa Cemetery, Auckland. A memorial service held in St. Matthew's Church, Auckland, was well attended, the staff and eleven hundred pupils of Auckland Girls' Grammar School being present; Wycombe Abbey School also paid its respects with a memorial service in the school chapel. Her name lives on at Wycombe Abbey; the school library, Whitelaw Memorial Library, was presented by her former pupils.

Whitelaw's sphere of activity was wide for a woman of her time, and she made important contributions to furthering education for girls and women in more than one country. However, one might ask if the missionary zeal that dominated her thinking by midlife, combined with her uncompromising philosophical position when her views differed from those of her educationalist colleagues, did not to a significant extent reduce the contribution she might have made to the cause of women's preuniversity education.

Wellington

Wellington Girls' High School, a state-supported secondary school with high academic standards, was established in Wellington city center in 1883, and Wellington College of Education, which trained many women teachers, dates back to 1880. The relatively late opening in 1899 of Wellington's Victoria College means that its graduates are well outside the time period adopted for this study, but it may be noted that, from its earliest days, Victoria College, like Canterbury College, had a high proportion of women among its students; classes were regularly held in the evenings and on weekends to accommodate the needs of schoolteachers and other full-time workers.

The best-known early woman professional of scientific background whose long working life was spent mainly in Wellington is most likely Agnes Bennett, originally from New South Wales.

AGNES ELIZABETH LLOYD BENNETT¹⁶⁰ (1872–1960) was the first woman to be awarded a B.Sc. degree with honors from the University of Sydney, which opened its doors to women in 1881. She concentrated on biology and geology, both areas that were attracting women students by the 1890s. Academic qualifications still being insufficient to disperse persisting prejudices against women in these fields, she quickly found herself seriously handicapped in her search for employment; as an alternative she turned to a career in medicine.

Born at Neural Bay, Sydney, on 24 June 1872, Agnes was the sixth of seven children in the family of William Christopher Bennett and his first wife, Agnes Amelia, née Hays. Irishman William Bennett was a successful engineer, commissioner of roads and bridges for New South Wales; his wife, the daughter of an Englishman who had married an American, was born in London but grew up in New York. The Bennett family had a spacious home and adequate financial resources.

Early in 1878, when she was five years old, Agnes, her two sisters, and her four brothers were taken by their mother to Britain for their schooling. They stayed for a short time in Cheltenham, where Agnes attended Cheltenham Ladies' College, then headed by girls' education pioneer Dorothea Beal; by late 1879 they had moved to Dulwich, North London. The three Bennett girls spent two years at a school run by the Girls' Public Day School Company, but in June 1881, immediately after the death of their mother from smallpox, they returned to Sydney. Agnes's education continued, first at the independent Anglican school Abbotsleigh, founded in 1885, and then at Sydney Girls' High School, an academically selective, public high school for girls, established in 1883 by the New South Wales Department of Education and Training. In 1889, the year of her father's death, she won a state scholarship to the University of Sydney, which she entered the following year. Her B.Sc. with honors in geology and biology was awarded in 1894. Blocked in her search for employment in a technical field, she spent a year as a governess in an isolated region of northern New South Wales. She then left Australia to study at the Medical College for Women in Edinburgh, an institution founded in 1886; in 1899 she received a University of Edinburgh M.B.Ch.M. degree, Scottish universities having by then opened their doors to women.

Since medical men were still somewhat reluctant to welcome women physicians into their ranks, Agnes Bennett accepted a position in the unpopular field of psychiatric medicine, an area in which women doctors frequently found employment. She spent several months as resident medical officer in Stirling District Lunacy Asylum, now Bellsdyke Hospital, in Larbert, about twenty-five miles west of Edinburgh. On returning to Sydney in 1901, she again met with prejudice against women doctors; her attempt to establish a private practice in Sydney was not successful, and in 1904 she became junior medical officer at the Hospital for the Insane in Callan Park, inner west Sydney. Six months later her prospects improved when she took the opportunity that arose to buy the medical practice of Isabella Watson in Wellington, a city in which there was a shortage of physicians. She was well liked, the practice prospered, and in 1908 she was appointed medical officer to St. Helen's Hospital, Wellington, the first state maternity hospital in New Zealand.¹⁶¹ Agnes Bennett worked hard to reduce infant, neonatal, and maternity death rates, which were among the lowest in the world when she retired in 1936; she considered her position at St. Helen's the most important one of her career. In 1910 she became honorary physician to the children's ward of Wellington Hospital, the first public hospital in New Zealand to appoint a woman physician to its staff. The thesis she presented to the University of Edinburgh in 1911 for an M.D. degree discussed data collected to demonstrate the benefits of breast-feeding infants.

On the outbreak of the First World War she offered her services to the New Zealand military and when turned aside sailed for Europe, intending to join the French Croix Rouge. During a break in her journey at Cairo, where a unit of the New Zealand medical corps was stationed, she renewed her offer. Accepted by the corps director, she was given the pay and status of captain, without a formal commission, and served with the unit at the Shoubra Base Hospital in Cairo until 1916, when she went on to London. After meeting with Edinburgh physician Elsie Inglis, founder of the Scottish Women's Hospitals for Foreign Service, she left for the Balkans as commanding officer of the organization's

Seventh Medical Unit. Landing at Salonika on 13 August 1916 as fierce fighting was beginning on the Macedonian front, she led this field hospital unit, which was attached to the Third Royal Serbian Army, until mid-1917, when, ill with malaria, she had to leave the Balkans. For her services she was awarded the Order of St. Sava, third class, and the Cross of Honor of the Serbian Red Cross. She worked for a further year (1917–1918) as medical officer on the troopships *Wiltshire* and *Paparoa* and on the cargo ship *Essex*¹⁶² and also helped in hospitals in Glasgow and Southampton during the influenza epidemic in 1918.

Back in Wellington by 1920, Agnes Bennett resumed her general practice and her position at St. Helen's Maternity Hospital. She also found time for work on broad social issues that had concerned her over the years. Joining the drive to establish a Wellington branch of the New Zealand Federation of University Women, she became the first president of the branch in 1922; in 1936 she represented New Zealand at an international conference of the federation in Cracow.

She gave up private practice in 1930, when she was fifty-eight, and six years later retired from her post at St. Helen's Maternity Hospital. About this time she built her house, Honda, at Lowry Bay in quiet, scenic Hutt Valley to the north of Wellington, but she by no means settled into conventional retirement. Following the 1931 Hawke's Bay earthquake, she took immediate action, collecting equipment, driving to the affected area, and reporting to the Red Cross in Wellington on what was needed. The same year, when New Zealand took the unprecedented step of including two women doctors in the delegation it sent to the British Medical Association conference in England, Agnes Bennett was one of them. In 1938–1939, responding to a request from an Australian colleague, she spent a year as medical officer at the hospital staffed by "flying doctors" at Burktown, Northern Queensland, on the shores of the Gulf of Carpentaria.

The start of the Second World War brought her even further out of retirement. Her first step was to join in the effort to found the Women's War Service Auxiliary of New Zealand, a voluntary organization integrated in 1942 into the official New Zealand Women's Army Auxiliary. Sailing as medical officer on the *Port Alma*, she then left for Britain, where she worked from December 1940 until 1942, first with the Women's Voluntary Service during the London blitz and then as resident in a succession of hospitals in the south of England. After returning to New Zealand, she traveled around the country, giving lectures on sex education for young service women. Her last recorded notable medical work came in the winter of 1947; although then age seventy-five, she responded to an appeal for a temporary replacement doctor on the bleak, isolated Chatham Islands (figure 3.3), the resident medical officer being seriously ill. She flew out to the islands and spent five weeks there, making her rounds on horseback over very rough territory in severe cold. The OBE award (Officer of the Order of the British Empire) she received in 1948 is considered to have been, in part, a recognition of her Chatham Islands work.

Agnes Bennett's early struggles to prepare herself for professional work inclined her to strongly support the cause of higher education for women. As early as 1909 she and Emily Siedeberg (see above) publicly clashed with Otago Medical School specialist Frederic Truby King (later Sir Frederic), a very influential and nationally recognized leader in the field of child health. Then and at the 1914 conference of the Australasian branch of the British Medical Association, King and his colleague Ferdinand Batchelor argued that the strains of study and academic life, especially for those in the mathematically based sciences to which he considered women not adapted, were detrimental to women's reproductive functions and therefore to the population as a whole. Agnes Bennett's reasoned arguments against this view were soon reinforced by the many and varied contributions made by women during the First World War.

From the early 1930s she had lived in her house at Lowry Bay, but in 1947 she gave the house to the Women's Division of the Farmer's Union as a rest center and for herself built a smaller house nearby. She died in Wellington on 27 November 1960 at the age of eighty-eight. In 1955 and 1956 she had given 10,000 pounds to the University of Sydney to support an aeronautical research laboratory in memory of her parents; the residue of her estate, 26,490 pounds, also went to the university. Agnes Bennett's long career was remarkable, and her accomplishments were impressive, from her early struggles to gain entrance to her profession, to her contributions to women's and infants' health, her war work, and her strenuous undertaking on the Chatham Islands; she left an enviable record.

SUMMARY

This survey examines a fairly varied group of early New Zealand women whose work in one way or another touched on scientific development. The wide range is presented in an attempt to gain a general picture of the overall role played by women in science and science education in late nineteenth- and early twentieth-century New Zealand. To have included only women who authored scientific research reports would have resulted in a narrow and unsatisfactory sampling that would not have done justice to New Zealand society at this period when settlement was still relatively recent and numbers low, although, despite distance and isolation, connections with Britain were strong.

Two features stand out. One is the sizable body of admirable work produced by the botanical artists and illustrators, and the other is the turning of the first generation of the country's women university graduates to careers in medicine and education, particularly the development and administration of secondary schools.

Most of the earliest botanical artists, Martha King, Emily Harris, and Georgina Hetley among them, were settlers from Britain or Ireland. King and Harris took up art and illustration in part to eke out a livelihood in rough conditions; but all the early flower painters, from King in the 1870s and 1880s to Margaret Stoddart at the turn of the century, drew their inspiration from the novelty, beauty, and variety of New Zealand plant life. Georgina Hetley and Sarah Featon in particular were very conscious of the pressing need to record this flora in its fullness before cultivation by settlers inevitably brought extinctions. The legacy of these artists, which includes two outstanding published albums, as well as collections of original paintings, constitutes a worthy addition to the historical record of antipodean flora; it may reasonably be considered the major contribution made by women to early scientific work in New Zealand. As a glance through the contents lists of early volumes of the *Transactions and Proceedings of the New Zealand Institute* shows, published research in the sciences in New Zealand was dominated by self-taught amateurs until well after the start of the twentieth century. Leading figures in botanical studies and natural history in general included William Williams, William Colenso, and T. F. Cheeseman, all of whom produced an impressive amount of published work; the women illustrators, working at the borderline between art and science, were a small but not unimportant part of this amateur community, valued and encouraged by their male colleagues.

Participation by women in early amateur astronomical work in New Zealand appears to have been very slight, even compared with that of women in Australia and South Africa. By the 1890s both Sydney and Melbourne had branches of the British Astronomical Association, an organization open to women, while Cape Town residents had the stimulation afforded by the presence of the Cape Observatory, a major institution where women were being employed as "computers" by the 1890s. Late nineteenth-century New Zealand women had few readily accessible ways of becoming involved in significant astronomical activities; only one has been identified here, Miss Hirst of Auckland, a lady of independent means who could afford an adequate telescope of her own.

Given the fact that institution-based postgraduate research in New Zealand came largely after the start of the twentieth century,¹⁶³ the pre-1900 paper count for women fits readily into the larger historical pattern; two of the four papers found in the Royal Society's *Catalogue* were by undergraduates, another a joint publication of a woman assistant and a male faculty member. Both the undergraduate authors were training for secondary school teaching, a worthwhile goal, given the times and the career prospects open to them. Along with the first generation of women physicians, the educationalists made a considerable contribution toward widening and improving the prospects for New Zealand girls and women. Schools such as Wanganui Girls' College, developed largely by Christina Cruickshank, and Nelson College for Girls, guided through its earliest years by Kate Edger, are but two of a number of still-flourishing, solidly academic girls' high schools established about this period; many of them now have an international enrollment that includes girls from other Pacific region countries.

Nearly all the women mentioned here had strong interests in the sciences, the painters being well versed in botanical characteristics and habitat details of their floral subjects, the educators very conscious of the need to provide the next generation of women with the knowledge to go on to careers in all fields, including the sciences. Among the physicians, two especially, Emily Siedeberg and Agnes Ben-

nett, although their immediate concerns were the health aspects of women's lives, took a strong public stand against those who would block women's access to a science- and mathematics-based education.

Perhaps the most colorful and memorable women in this study are the botanical artists, particularly those from the earliest settler period; the story of flower painter Fanny Osborne in her rough and isolated but in many ways idyllic island home has great charm and appeal. Among the early graduates, many of whom became leading figures in their communities, the calm and competent institution builder Christina Cruickshank and the strong-willed, capable, and marvelously adventurous physician Agnes Bennett stand out as women of special interest.

NOTES

1. For a full account see for instance Rewa Glenn, *The Botanical Explorers of New Zealand* (Wellington: A. H. & A. W. Reed, 1950).

2. See Achille Richard, *Essai d'une flore de la Nouvelle-Zélande*, Part 1 of the Second Division, *Botanique*, of Jules Dumont d'Urville, Pierre Lesson, and Achille Richard, *Voyage de découvertes de l'Astrolabe: exécuté par ordre du Roi pendant les années 1826–1829 sous le commandement de M. J. Dumont d'Urville*, 12 vols. (Paris: J. Tastu, 1832–1834). Richard's *Essai d'une flore* was followed in 1833–1834 by the publication of an illustrated *Atlas* with eighty outstanding engravings, most of them colored, of New Zealand plants; a number of these engravings were prepared by women engravers. This work by Richard, a leading French botanist and prolific author, was the first dealing with the flora of New Zealand as a whole. See School of Biological Sciences, University of Auckland, New Zealand Plants Timeline, section for 1800–1849, www.sbs.auckland.ac.nz/uoa/science/about/departments/sbs/newzealandplants/new-zealand-plants-timeline/1800-to-1849.cfm (March 2009).

3. Moira Long, "Martha King: Botanical artist," in *The Summer Book 2: A New Zealand Miscellany*, comp. Bridget R. Williams, Roy Parsons, and Lindsay Missen (Wellington: Port Nicholson Press, 1983), 56–65, and "King, Martha, 1802/03?–1897," in *Dictionary of New Zealand Biography*, online ed., updated 7 April 2006, www.dnz.govt.nz/ (June 2006); Bee Dawson, *Lady Painters: The Flower Painters of Early New Zealand* (Auckland: Viking, an imprint of Penguin Books, Penguin Books (NZ), 1999), 13–27; F. Bruce Sampson, *Early New Zealand Botanical Art* (Auckland: Reed Methuen, 1985), [83]–[84].

4. Dawson, *Lady Painters*.

5. Dawson, *Lady Painters*, 26.

6. Edward Jerningham Wakefield, *Illustrations to Adventure in New Zealand* (London: Smith, Elder & Cornhill, 1845; facsimile ed. of 500 copies, Wellington: A. W. Reed, 1968); abridged ed., Joan Stevens, ed. (Christchurch: Whitcombe and Tombs, 1955, Auckland: Viking, 1987). Edward Jerningham Wakefield, a settler in New Zealand, was the son of Gibbon Wakefield, an energetic British campaigner of systematic emigration as a means of solving the problems of overpopulation identified by Malthus. Gibbon Wakefield was largely responsible for the organization of the New Zealand Company, in whose emigrant ship the *Kings* traveled to New Zealand. The Wakefields continue to be subjects of considerable research effort and more general interest; see for instance Patricia Burns and Henry Richardson, *Fatal Success: A History of the New Zealand Company* (Auckland: Heinemann Reed, 2002), Phillip Temple, *A Sort of Conscience: The Wakefields* (Auckland: Auckland University Press, 2002), and Rebecca Ann Durrer, "Changing British imperial ideology: Edward Gibbon Wakefield and the colonization of New Zealand," Ph.D. thesis, University of Houston, 2000.

7. Martha King's forty paintings are now housed in the Alexander Turnbull Library, Wellington.

8. Dawson, *Lady Painters*, 27.

9. John Tyson Wicksteed (1806–1860), for a time resident agent for the New Zealand Company in New Plymouth, later acquired land at Omata and became editor of the *Taranaki Herald*. In 1852 he was appointed to the Legislative Council for New Ulster. After moving to Wanganui in 1853, he edited the *Wanganui Chronicle* for a time; he was also a competent artist. His wife, Emma Ancilla, née Barton (1811?–1869), was probably English. See Una Platts, *Nineteenth Century New Zealand Artists: A Guide and Handbook* (Christchurch: Avon Fine Prints, 1980).

10. Dawson, *Lady Painters*, 26.

11. Dawson, *Lady Painters*, 29–43; Sampson, *Early New Zealand Botanical Art*, especially [101]; Janine Graham, "Emily Harris: the artist as social commentator," *Historical News* 39 (1979): 6–10; Sorrel Hoskin, "Emily Harris—flowers, berries and ferns," in *Taranaki Stories*, published by Puke Ariki, the Taranaki Cultural Center (July 2005), online at www.pukeariki.com/en/stories/arts/emilyharris.asp (June 2009).

12. See note 6.

13. Emily Cumming Harris, *New Zealand Flowers* (Nelson: H. D. Jackson, 1890); *New Zealand Berries*, and *New Zealand Ferns*, as well as the one-volume issue, *New Zealand Flowers; New Zealand Ferns; New Zealand Berries*, appeared the same year (Nelson: H. D. Jackson, 1890). Printing was done in London.

14. Sarah Rebecca Moore (Mrs. Ambrose Eyles Moore), illustrator Emily Cumming Harris, *Fairyland in New Zealand: A Story of the Caves* (Auckland: Brett Printing and Publishing, 1909).

15. *New Zealand Flower Paintings* [art reproduction], from watercolors by E. C. Harris (Alexander Turnbull Library, Endowment Trust) 1968; *Four more Watercolours of New Zealand Flowers and Berries* by E. C. Harris (Alexander Turnbull Library, Endowment Trust) 1979.

16. June Starke, "Hetley, Georgina Burne (1832–1898)," in *Dictionary of New Zealand Biography*, online ed., updated 7 April 2006, www.dnzb.govt.nz/ (June 2006); Sampson, *Early New Zealand Botanical Art*, [102]–[108]; Dawson, *Lady Painters*, 77–91.

17. By the 1860s the European population of New Zealand outnumbered that of the Maori, which had declined precipitously from over 110,000 in 1843 to 56,000 by 1857. In contrast, European numbers increased rapidly, reaching 626,000 in 1891. See David Ian Pool, *The Maori Population of New Zealand 1769–1971* (Auckland: Auckland University Press and Oxford University Press, 1977).

18. T. F. Cheeseman (1845–1923), whose family emigrated from England to New Zealand in 1854, had three talented sisters, Emma, Nelly, and Clara, all of whom helped him in various ways in his undertakings. Emma, a skilled taxidermist, prepared bird specimens for his collections and also produced botanical illustrations. Twenty-three of her beautiful, disciplined, spare and accurate, although stylized, watercolors and drawings are held in the Auckland Museum; thirteen are of orchids, one of Cheeseman's particular interests. Nelly Cheeseman's pen-and-ink sketches of landscapes and scenes of the Hauraki Gulf were particularly noteworthy. Clara, a regular contributor to *Blackwood's Magazine*, also published a novel, *A Rolling Stone* (London: R. Bentley, 1886). All three sisters joined Cheeseman in organizing an early field club whose members botanized in the hills around Auckland (see Glenn, *Botanical Explorers*, 162–63; Sampson, *Early New Zealand Botanical Art*, [123]–[124]); "From the editor: Emily Cheeseman's watercolours," *Orchid Journal* 61, *New Zealand Native Orchid Group*, www.anos.org.au/groups/newzealand/journals/nzsj-61.htm (June 2007).

19. G. B. Hetley (Mrs. Charles Hetley), *The Native Flowers of New Zealand. Illustrated in colours in the best style of modern chromo-litho art, from drawings coloured to nature* (London: Sampson Low, Marston, Searle & Rivington, 1887–1888), 3 pts.; 1 vol., 1888.

20. See Sampson, *Early New Zealand Botanical Art*, [107]; Janet Paul, "Botanical illustrations," in *New Zealand's Nature Heritage*, ed. Ray Knox (Auckland: Hamlyn, 1975–1976), vol. 7, no. 99 (1975): 2763–69, on 2768.

21. The chromolithographs were prepared by Leighton Brothers, London, a much respected firm, which also produced the color pictures for the *Illustrated London News* (Sampson, *Early New Zealand Botanical Art*, [107]).

22. *Loranthus adamsii*, first formally described by T. F. Cheeseman in 1880 ("Description of a new species of Loranthus," *Transactions and Proceedings of the New Zealand Institute* 13 (1880): 296–97) was later renamed *Trilepidea adamsii*. It is one of nine endemic New Zealand mistletoe species, of which six belong to the Loranthaceae and three to the Viscaceae. It appears to have had a very limited natural distribution at the time of European settlement, having been collected or recorded from only eight lowland sites in the north of New Zealand, despite considerable botanical exploration throughout the region. The first extensive collections were made near Thames in 1880. Fanny Osborne (see above) made three watercolors of *T. adamsii* from Great Barrier Island between 1900 and 1920, but it has not been recorded there subsequently. Last seen in 1954, it is now presumed extinct. See David A. Norton, "*Trilepidea adamsii*: An obituary for a species," *Conservation Biology* 5 (1991): 52–57.

23. Hetley, *Native Flowers* (1888), 1.

24. Mme Ch[arles] Hetley et M. É[douard] Raoul, ed. Challamel et cie et Charles Bayle, *Fleurs sauvages et bois précieux de la Nouvelle-Zélande. Ouvrage illustré à profusion de magnifiques planches en couleur représentant 46 plantes en fleurs, presque toutes non figurées jusqu'à ce jour, plantes et fleurs dessinées en peintes d'après nature* (Londres: Sampson Low, Marston, Searle et Rivington; Paris: Galignani, 1889), limited edition of fifty copies.

25. See Étienne Raoul, *Choix des plantes de la Nouvelle-Zélande, recueillies et décrites* (Paris: Fortin, Mason et cie, 1846).

26. Glenn, *Botanical Explorers*, 80; Leonard Cockayne, *New Zealand Plants and Their Story* (Wellington: Government Printer, 1910), 97–99.

27. Dawson, *Lady Painters*, 61–75; Sampson, *Early New Zealand Botanical Art*, [93]–[95]; Joseph Angus Mackay, *Historic Poverty Bay and the East Coast, N. I., N. Z.*, 2nd ed. (Gisborne, N. Z.: J. G. Mackay, 1966).

28. “Shipping and Passenger Lists. Ships arrival and departure—Auckland,” <http://freepages.genealogy.rootsweb.com/~shamere/A.html> (June 2009); Megan Pledger, “Marriage notices from the *New Zealand Herald*, Auckland, New Zealand, in the year 1870,” <http://freepages.genealogy.rootsweb.ancestry.com/~babzNZ/NZHerald1870marriages.html> (June 2009).

29. John Featon published a 100-page account of the Waikato War, later expanded to a 232-page work that included a section on the Maori leader Te Kooti. See John Featon, *The Waikato War, 1863–4* (Christchurch: Kiwi Publishers, 1879, 1996); John Featon, *The Waikato War, together with some account of Te Kooti Rikirangi*, new ed., revised by Captain Gilbert Mair (Auckland: Brett Printing and Publishing, 1923). Gilbert Mair, coauthor of the expanded edition, was a prominent officer in the New Zealand land wars, including the campaigns against Te Kooti. In 1911 and 1912 Featon’s work was also brought out serially in the *Auckland Star*, the newspaper published by the Brett Company. Unfortunately John Featon omitted all mention of his own or his brother’s personal experience in the campaigns.

30. See for instance James Cowan, *The New Zealand Wars: A History of the Maori Campaigns and the Pioneering Period: Volume II: The Hauhau Wars, 1864–72* (Wellington: R. E. Owen, Govt. printer, 1922–1923 and several later editions; reprinted New York: AMS Press, 1969).

31. The Pai-marire or Hauhau religious cult, which welded many tribes in a bond of hate for the *pakeha* (the settlers), combined ancient Maori religious beliefs with the fire-and-brimstone Old Testament teachings of Christian missionaries (see Cowan, *New Zealand Wars*, vol. II, 3).

32. The organizational structure of these artillery units very soon underwent changes, some units being quickly disbanded, reformed, or amalgamated with neighboring units. See “NZ Regiment of Volunteer Artillery,” www.riv.co.nz/rnza/units/volarty.html (June 2009).

33. Dawson, *Lady Painters*.

34. However, Edward Featon was instrumental in the planning and construction of the first library building in Gisborne. One of the oldest public libraries in New Zealand, the Turanganui Library (initially called the Turanga Library) had been opened in 1869 in a room in the Gisborne courthouse, but about 1873 a new site was set aside for it. Very interested in literature and art, Featon was a member of the library committee and one of the trustees. The list of his fellow trustees in January 1880 provides a sidelight on Gisborne society in the Featons’ time: in addition to surveyor/draftsman Featon there were two more surveyors, a carpenter, a chemist (pharmacist), an ironmonger, an accountant, a butcher, a cabinetmaker, a clerk, and, on the library committee, two interpreters; see “Auckland public libraries registered under the Public Libraries Powers Act, 1875,” appendix VIII in Glenda Northey, “Accessible to All? Libraries in the Auckland Provincial Area, 1842–1919,” M.A. thesis, Auckland, University of Auckland, Department of History, 1998.

35. See for instance Archdeacon W. L. Williams, “Phenomena connected with the Tarawera eruption of 10 June, 1886, as observed at Gisborne,” *Transactions and Proceedings of the New Zealand Institute* 19 (1886): 380–82.

36. Colenso had come to New Zealand in 1834 as a young man of twenty-three, sent by the London-based Church Missionary Society to take out and set up a printing press to produce books in Maori, especially translations of parts of the New Testament prepared by the Rev. William Williams, already resident in the North Island. Within a year or so of his arrival, Colenso became deeply interested in the country’s flora, as well as in Maori language and culture. He explored throughout the North Island, often with Maori companions, and became familiar with much of the flora and fauna; alpine plant life he found especially impressive. Colenso’s publications include “On the vegetable food of the ancient New Zealanders before Cook’s visit,” *Transactions and Proceedings of the New Zealand Institute* 13 (1880): 3–38; “Historical incidents and traditions of the olden times pertaining to the Maoris of the North Island, (East Coast), New Zealand; . . .,” *Transactions and Proceedings of the New Zealand Institute* 13 (1880): 38–57; 14 (1881): 3–33; “Contributions towards a better knowledge of the Maori race,” *Transactions and Proceedings of the New Zealand Institute* 11 (1878): 77–106; 12 (1879): 108–47; 13 (1880): 57–84; 14 (1881): 33–48, 49–76. Many reports by Colenso on previously unknown plants from New Zealand were also published in the New Zealand Institute’s *Transactions and Proceedings*; see for example “A description of a few new plants from our New Zealand forests,” *Transactions and Proceedings of the New Zealand Institute* 12 (1879): 359–67; 14 (1881): 329–41; “Descriptions of a few new indigenous plants,” *Transactions and Proceedings of the New Zealand Institute* 15 (1882): 320–39; “A description of four new ferns from our New Zealand forests,” *Transactions and Proceedings of the New Zealand Institute* 15 (1882): 304–10; “A further contribution towards making known the botany of New Zealand,” *Transactions and Proceedings of the New Zealand Institute* 16 (1883): 325–63; “A description of some newly-discovered and rare indigenous plants; being a further contribution . . .,” *Transactions and Proceedings of the New Zealand Institute* 17 (1884): 237–65.

37. See Glenn, *Botanical Explorers*, 87–99; Cockayne, *New Zealand Plants*, 19–21.

38. Edward Henry Featon and Sarah Featon, illustrator, *The Art Album of New Zealand Flora, being a systematic and popular description of the native flowering plants of New Zealand and the adjacent islands* (Wellington: Bock & Cousins, 1889; originally issued in 3 pts., 1887, 1888, 1888).

39. Paul, "Botanical illustrations," 2768.

40. Influenza, dysentery, typhoid, and other diseases then took a heavy toll among settlers as well as Maoris.

41. Dawson, *Lady Painters*, 45–59; Sampson, *New Zealand Botanical Art*, [85]; Tony Mackle, "Osborne, Fanny, 1852–1934," in *Dictionary of New Zealand Biography*, online ed., updated 7 April 2006, www.dnzb.govt.nz/ (May 2006); Jeanne H. Goulding, *Fanny Osborne's Flower Paintings* (Auckland: Heinemann Publishers, 1983); Janice C. Mogford, "Malcolm, Emilie Monson, 1829/1830?–1905," in *Dictionary of New Zealand Biography*, online ed., updated 7 April 2006, www.dnzb.govt.nz/ (May 2007); Emilie Malcolm, *My Own Story: An Episode in the Life of a New Zealand Settler of 50 Years Back* (Auckland: Brett Printing & Publishing, 1904).

42. Goulding, *Fanny Osborne's Flower Paintings*.

43. Dawson, *Lady Painters* (1999) indicates that Barstow became a magistrate in Auckland; Mogford, "Malcolm, Emilie Monson" (1990, updated 2006) states that he was appointed magistrate at Russell. Russell (Kororareka), on the Bay of Islands near the northern tip of the North Island, is a place of considerable historical interest, being the first permanent European settlement in New Zealand. A rough, lawless community in its earliest days, it was then known as "the Hell-hole of the Pacific"; the mixed population of Maoris and Europeans included many ships' deserters and time-expired convicts from New South Wales. In 1840 it was the largest European settlement in the country, an important whaling, sealing, and mercantile center, though still very much a wild, frontier town. For nine months that year it was New Zealand's "capital," but in 1841 the seat of government was moved to Auckland, where it remained until 1865. Kororareka, or Russell, is now a popular holiday center, a small, historic town in a beautiful natural setting ("Russell," www.tapeka.com/russell.htm [June 2009]).

44. Communication between Great Barrier Island and Auckland was much speeded up in 1896 when the world's first regular airmail service, a "pigeongram" post, was begun. A message that had previously taken three or four days to reach Auckland by sea could be carried by a bird (with a favorable tailwind) in an hour.

45. See note 22.

46. *Brett's Christmas Annual* was published as a supplement to the daily newspaper *Auckland Star*. Like other newspapers of the first half of the twentieth century, the *Auckland Star* used its lavishly illustrated Christmas supplement in part as a showcase for the capabilities of its process department; see John Ross and K. A. Coleridge, "Printing and production," in *Book and Print in New Zealand: A Guide to Print Culture in Aotearoa*, ed. Penelope Griffith, Douglas Ross Harvey, and Keith I. D. Maslen, assisted by Ross Somerville (Wellington: Victoria University Press, 1997).

47. Dawson, *Lady Painters*, 108–23; Julie King, "Stoddart, Margaret Olrog, 1865–1934," in *Dictionary of New Zealand Biography*, online ed., updated 7 April 2006, www.dnzb.govt.nz/ (May 2006), "Margaret Stoddart," in *The Book of New Zealand Women: Ko Kui Ma Te Kaupapa*, ed. Charlotte Macdonald, Merimeri Penfold, and Bridget Williams (Wellington: Bridget Williams Books, 1991, 1992), 628–30, and "Flower hunters in the colonial landscape: Contexts and connections," *Bulletin of New Zealand Art History* 17 (1996): 13–26; Morag Lawrence, "The Stoddart family of Diamond Harbour," www.nzine.co.nz/features/stoddart.html?Rcat=History&Teat=New_Zealand_History (June 2009).

48. Thomas Henry Potts (1824–1888), who emigrated to New Zealand from England in 1854, was an enthusiastic plantsman with a nursery business in Christchurch. He explored extensively in the mountains of Canterbury and Westland as well as in the Banks Peninsula, contributing many reports of his observations, particularly notes on birds and plants, to periodicals such as the *Transactions and Proceedings of the New Zealand Institute* and the *London Journal of the Linnean Society*. He was a strong advocate of forest conservation. Among his new species discoveries were the roa or great grey kiwi and the black-billed gull. Potts was also prominent in public life, serving, successively, in the Canterbury Provincial Council and the House of Representatives. A member of the Canterbury Philosophical Society and the Canterbury Acclimatization and Agricultural Society, he was also a trustee of both Canterbury College and the Canterbury Museum; see Alan Drummond McKinnon and Lanna Coughlan, "Potts, Thomas Henry," in *Te Ara—The Encyclopedia of New Zealand*, ed. A. H. McLintock, originally published 1966, updated 26 Sept. 2006, www.teara.govt.nz/1966/P/PottsThomasHenry/en (June 2009).

49. Geologist and explorer Sir Julius von Haast (1822–1887), formerly Johann Franz Haast, was born in Bonn, Germany, and educated in Bonn and Cologne. After several years during which he had a succession of commercial occupations, he was commissioned by a firm of British shipowners to report on prospects for German immigration to New Zealand. On his arrival in Auckland in December 1858, he by chance met German geologist Ferdinand von Hochstetter (1829–1884), whom he joined for eight months of explorations, becoming Hochstetter's enthusiastic pupil. Asked by the Nelson provincial government to carry out surveys of the west coast, Haast stayed on in New Zealand and undertook geological investigations in Canterbury throughout the 1860s; from 1861 he held the post of Canterbury provincial geologist. A man of many interests, he published on a whole range of topics in various

branches of geology, paleontology, ethnology, and natural history; his work on the extinct moa was especially well known. Haast founded the Philosophical Institute of Canterbury in 1862, was appointed first director of the Canterbury Museum in 1868, and together with Bishop Harper established the Canterbury Collegiate Union to promote the formation of Canterbury College; he became the college's first professor of geology in 1876. He received an Austrian knighthood in 1875, at which time he added "von" to his name. A naturalized British subject from 1861, he was knighted (KCMG) in 1886. Over the years he kept in contact with Ferdinand von Hochstetter and supplied many New Zealand specimens for collections in the Vienna Imperial Museum of Natural History, of which von Hochstetter was director from 1876 until his death in 1884. See Glenn, *Botanical Explorers*, 122–24; Wolfhart Langer, "Haast, Sir (John Francis) Julius von (1822–1887)," in *Oxford Dictionary of National Biography*, online ed., www.oxforddnb.com/view/article/11828 (May 2007). Haast's *Geology of the Provinces of Canterbury and Westland, New Zealand* was published in Christchurch in 1879; for an account of von Hochstetter's explorations in New Zealand see Ferdinand von Hochstetter, *New Zealand, its Physical Geography, Geology and Natural History: with special reference to the results of the government expeditions in the provinces of Auckland and Nelson*, trans. Edward Sauter (Stuttgart: J. G. Cotta, 1867).

50. The Moriori were the indigenous people of Rekohu (Chatham Island) and Rangiaotea (Pitt Island), the two largest islands in the Chatham group. They are now considered to have been of Polynesian ancestry, closely related to the New Zealand Maori, although they had their own distinctive traditions. Current research indicates that they came to the Chatham Islands from New Zealand. Following the arrival of European whalers and sealers in the 1790s, their numbers declined sharply, their major food sources, seal and birds, being decimated. Tame Horomona Rehe Solomon, thought to have been the last full-blooded Moriori, died in 1933; see Denise Davis and Māui Solomon, "Moriori," in *Te Ara—The Encyclopedia of New Zealand*, updated 21 December 2006, www.teara.govt.nz/NewZealanders/MaoriNewZealanders/Moriori/en (June 2009); "The Moriori," www.history-nz.org/moriori.htm (June 2009).

51. Ellis Rowan, *A Flower-Hunter in Queensland and New Zealand* (Sydney: Angus and Robertson, 1898), 251.

52. King, "Flower hunters," 16.

53. Dawson, *Lady Painters*.

54. Botanical art critic Janet Paul wrote that Margaret Stoddart "painted flowers with an understanding of their essence and an almost Chinese economy." (Paul, "Botanical illustrations," 2769).

55. Dawson, *Lady Painters*, 93–107; Peter Entwisle, "Hodgkins, William Mathew, 1833?–1898," in *Dictionary of New Zealand Biography*, online ed., updated 7 April 2006, www.dnzb.govt.nz/ (May 2006).

56. Linda Gill, "Hodgkins, Frances Mary, 1869–1947," in *Dictionary of New Zealand Biography*, online ed., updated 7 April 2006, www.dnzb.govt.nz/ (May 2006); E[ric] H. McCormick, "Frances Hodgkins. The Path to Impressionism: 1892–1912" (a slightly revised version of the Canaday Lecture given at the Waikato Art Museum, Hamilton, on 15 October 1979), www.art-newzealand.com/Issues11to20/fhpath.htm (June 2009).

57. H. A. A., "Obituary: Robert Malcolm Laing (1865–1941)," *Transactions and Proceedings of the Royal Society of New Zealand* 73 (1943–44): XLIX–L, on L.

58. R. M. Laing and Ellen W. Blackwell, *Plants of New Zealand* (Christchurch: Whitcombe and Tombs, 1906 and six later editions, most of them revised, between 1907 and 1964).

59. Richard Kenneth Dell, "Ellen Wright Blackwell, 1864–1952: Writer, botanist," in *Dictionary of New Zealand Biography*, online ed., updated 22 June 2007, www.dnzb.govt.nz (March 2008); Andrew David Thomson, "Ellen Blackwell, the mystery lady of New Zealand botany, and *Plants of New Zealand*," *New Zealand Botanical Society: Newsletter* 41 (1995): 15–18.

60. See for instance Grace Winter, *Paul the Ambassador: The Life-story of the Great Apostle Re-told for Young People* (London: Pilgrim Press, 1900).

61. See note 57.

62. Dick Scott, *Seven Lives on Salt River* (Auckland: Hodder and Stoughton, 1987).

63. J. B. Hearnshaw, "Astronomy in New Zealand," in *Organizations and Strategies in Astronomy*, ed. A. Heck (Dordrecht: Springer, 2005), vol. 6, 63–86; R. A. McIntosh, "The astronomical history of the Auckland Province, Part I: The Maoris," *Amateur Astronomer* 17, no. 2 (1957): 20–22, "Part 2: Eighteenth century," *Amateur Astronomer* 17, no. 3 (1957): 40–42, "Part 3: Nineteenth century," *Amateur Astronomer* 18, no. 1 (1958): 3–6, "Part 4: John Grigg, F.R.A.S.," *Amateur Astronomer* 18, no. 2 (1958): 20–23, "Part 5: The first astronomical society," *Amateur Astronomer* 18, no. 3 (1959): 46–48, "Part 6: Early twentieth century," *Amateur Astronomer* 18, no. 4 (1959): 60–65, "Footnote to history," *Amateur Astronomer* 19, no. 1 (1960): 7–8; Vicki Hyde, *Godzone Skies: Astronomy for New Zealanders* (Christchurch: Canterbury University Press, 1992).

64. Elsdon Best, *The Astronomical Knowledge of the Maori, Genuine and Empirical* (Wellington: Dominion Museum Monograph no. 3, New Zealand Government Printer, 1972, reprint of 1955 revised edition, first published 1922); see also Hyde, *Godzone Skies*, 9.

65. Wayne Orchiston, "John Grigg, and the genesis of cometary astronomy in New Zealand," *Journal of the British Astronomical Association* 103 (1993): 67–76, and "The Thames observatories of John Grigg," *Southern Stars* 40 (2001): 14–22.
66. Robert N. Campbell, "Early astronomy in Otago," *Southern Stars* 40 (2001): 12–13.
67. *Transactions and Proceedings of the New Zealand Institute. Proceedings of the Otago Institute* sections, online printings for volumes from the 1880s to 1900, <http://rsnz.natlib.govt.nz/allvolumes.html/> (Aug. 2007).
68. *Daily Telegraph*, Dunedin, 26 March 1863, quoted by Campbell, "Early astronomy," 12.
69. For a note on Mrs. Burn see the section on Otago Girls' High School.
70. Orchiston, "Thames observatories," 20.
71. McIntosh, "Astronomical history: Part 5."
72. S. J. Lambert, "Remarks on drawings of Jupiter made by Miss Hirst, at Auckland, New Zealand," *Monthly Notices of the Royal Astronomical Society* 35 (1875): 401–3.
73. See Lambert, "Remarks on drawings of Jupiter," and G. D. Hirst, "Some notes on Jupiter during his opposition of 1876," *Journal and Proceedings of the Royal Society of New South Wales* 10 (1876): 83–96, Discussion, 97–98, quotation from Miss Hirst, 94. George D. Hirst, a well-known amateur astronomer and stellar photographer in Sydney and a member of the Sydney section of the Royal Astronomical Society, observed Jupiter's color zones and their variation over several years in the late 1870s. One might speculate on a family connection between him and Miss Hirst of Auckland, but he indicated none such when referring to her work, and none has been uncovered.
74. Lambert, "Remarks on drawings of Jupiter," 401.
75. Gary J. Tee, "Professor and Mrs. Aldis: Mathematics, feminism and astronomy in Victorian Auckland," *Southern Stars* 38 (1998): 18–27, and "Transit of Venus 2004," *Mathematics Today* (Southend-on-Sea, Essex, UK), (April 2003): 64; D. A. Nield, "Professors of mathematics at Auckland University College: The missionary, the businessman, the storyteller and the salesman," *New Zealand Mathematical Society Newsletter* 27 (1983); Keith Sinclair, *A History of the University of Auckland, 1883–1983* (Auckland: Auckland University Press, Oxford University Press, 1983).
76. Albert Edward Aldis (1870–1921), a landscape painter, exhibited with the Auckland Society of Arts in 1888. By the following year he had moved to Sydney, where he lived from then on. He is now regarded as an Australian painter. See the website of the Fletcher Trust, Penrose, Auckland, www.fletchercollection.co.nz/item.php?id=336&details=1#description (June 2009).
77. Mary Aldis, *The Giant Arithmos: A Most Elementary Arithmetic* (London: Macmillan, 1882), 216 pp., illustrated.
78. Mary Steadman Aldis, *Consider the Heavens: A Popular Introduction to Astronomy* (London: Religious Tract Society, 1895), illustrated.
79. W. W. Campbell, "Concerning an atmosphere on Mars," *Publications of the Astronomical Society of the Pacific* 6 (1894): 273–83.
80. William Robinson, *The Sin of Conformity: An Appeal to Episcopalians*, ed. Mary Steadman Aldis (Auckland: Wm. McCullough, printer, 1886), 14 pp.
81. See Women's Suffrage Collection, Manchester Central Library. Part 2: The papers of Millicent Garrett Fawcett—sections on Women's Suffrage, Education, Employment . . . , item 180. An 1892 letter of Aldis to Fawcett is listed. Aldis-Davies correspondence is held in Girton College Archives, Cambridge, Personal Papers of Sarah Emily Davies, Box 13. This includes several letters between February and May 1880 concerning the admission of women to Cambridge degrees; see <http://janus.lib.cam.ac.uk/db/node.xsp?id=EAD%2FGBR%2F0271%2FGCPP%20Davies%2013> (June 2009).
82. That year the title was given to the man with the next highest score below that of Philippa Fawcett; see Mary R. S. Creese, *Ladies in the Laboratory? American and British Women in Science, 1800–1900* (Lanham, Md.: Scarecrow Press, 1998), 190–91.
83. The federal university of New Zealand, established by statute in 1870, remained the examining and degree-granting body for all New Zealand university institutions until 1961. The separate universities were colleges of the University of New Zealand and issued the degrees in its name.
84. William Steadman Aldis, *A Chapter on Fresnel's Theory of Double Refraction* (Cambridge: Deighton, Bell and Co., 1870, 2nd ed. 1879), 27 pp.; *An Elementary Treatise on Rigid Dynamics* (Cambridge: Deighton, Bell, 1882), Cambridge Mathematical Series; *An Elementary Treatise on Solid Geometry* (Cambridge: Deighton, Bell, 2nd ed. 1873, reissued 1965); *A Textbook of Algebra* (Oxford: Clarendon Press, 1887); *An Elementary Treatise on Geometrical Optics* (Cambridge: Deighton, Bell, 1872, 4th ed. 1893).
85. John A. Salmond, "Salmond, Sarah 1864–1956," in *Dictionary of New Zealand Biography*, online ed., updated 22 June 2007, www.dnz.govt.nz/ (Nov. 2007).

86. Christian Heinrich Friedrich Peters (1813–1890) was born in Schleswig, received a doctorate from Berlin University, and later held a succession of positions at European universities, including both German (Göttingen) and Italian. Caught up in the mid-nineteenth-century Italian struggle for unification and liberation from Austria, he had to leave Italy and in 1854 arrived in the United States. After holding a number of temporary positions, he became professor of astronomy at Hamilton College, then a small college for men in New York State. The institution had just acquired a new observatory, named the Litchfield Observatory after its financial backer, a Mr. Litchfield. See memoir by William Sheehan, National Academies Press, *Biographical Memoirs*, online ed., www.nap.edu/readingroom.php?book=bimems&page=cpeters.html (June 2009).

87. Hector [Carsewell] MacPherson, *The Heavens Declare . . .* (Edinburgh: Church of Scotland Committee on Publications, 1937), 31 pp., no. 3 in the series *Nectamen consumebatur*.

88. James David Salmond and Sara [sic] Salmond, *Hearts of Gold: Memories of Old Queenstown* (Dunedin: *Otago Daily Times*, 1962), 58 pp.

89. Anon., “History of the University of Otago,” www.otago.ac.nz/about/history.html (June 2009).

90. Madras College, St. Andrews, was attended by both boys and girls from its founding by Dr. Andrew Bell in 1833. See www.madras.fife.sch.uk/archive/articles/inthefootstepsofdrbell.html (June 2009). For Dalrymple see Dorothy Page, “Dalrymple, Learmonth White 1827?–1906,” in *Dictionary of New Zealand Biography*, online ed., updated 22 June 2007, www.dnzb.govt.nz (Oct. 2007); F P Biographies, Madras College, “Learmonth White Dalrymple,” www.madras.fife.sch.uk/archive/fpbiographies/dalrymple.html (June 2009).

91. See *The North London Collegiate School 1850–1950: A Hundred Years of Girls’ Education*, ed. R. M. Scringeour (London: Oxford University Press, 1950).

92. Margaret Gordon Burn (1825–1918), née Huie, the first principal of Otago Girls’ High School, was the oldest of the eight children of Alexander Huie, an accountant, and his wife, Eliza Gordon, née Edgar. She was born in Edinburgh on 22 March 1825. After some years of private tuition, she attended senior classes at Circus Place School, an Edinburgh school formed after the model of an English preparatory school; more language study under private tutors followed. She worked as a governess in Liverpool until 1852 when her father died and she, her mother, and her siblings moved to Geelong, Victoria. Then age twenty-seven, she immediately opened a small private school in Geelong. Five years later she married Andrew Burn, a teacher at Scotch College, Melbourne. When Burn became partially disabled by severe sunstroke in 1864, Margaret, to support herself and her three young children, opened Geelong Ladies’ College, which she ran very successfully along the lines of Circus Place School. In 1870 she was chosen for the position of principal of the new provincial girls’ high school in Dunedin (Otago Girls’ High School); she and her three children arrived at Port Chalmers later that year. A fine teacher with a clear style, an outstanding organizer, and something of a diplomat when dealing with city and provincial officials, she was also a staunch Presbyterian in tune with the general social outlook of Dunedin. She very competently led the school through its first thirteen years, until her retirement in 1884. In 1887, although then sixty-two, she returned to teaching, becoming principal of the new Waitaki Girls’ High School in Oamaru, sixty miles north of Dunedin. She taught all the first pupils, nine girls ages nine to eighteen, but after a time herself paid for a part-time assistant and much of the needed equipment. By the time she finally retired in 1892, the school, though still small, was well established; it now has about five hundred pupils, both academic and vocational. Margaret Burn returned to Dunedin, where she lived with family members and helped to bring up the children of her son Edgar, a widower from 1904, while also giving private tuition in French and English. She died in Dunedin on 8 December 1918 at the age of ninety-three. See Eileen Wallis, “Burn, Margaret Gordon 1825–1918,” in *Dictionary of New Zealand Biography*, online ed., updated 22 June 2007, www.dnzb.govt.nz (March 2008).

Margaret Burn was quite likely one of the first two women to become members of the Otago Institute, by 1869 one of the constituent parts of the New Zealand Institute. Very few women became members of the Otago Institute in the period up to 1900, but the two notable exceptions, both of whom maintained their memberships for many years, were Mrs. C. May of Napier and Mrs. Burn. Mrs. May, along with her husband J. T. May, had joined by 1869, and she remained a member until 1879, when she transferred to the Hawke Bay Institute, a group that started in 1874 and by 1879 already had two other women members, Mrs. Goswell and Miss J. Herbert, both of Wairoa. No further information has been found about Mrs. May. Mrs. Burn joined the Otago Institute in 1871 and remained a member until 1885. For a few years beginning in 1884 Learmonth White Dalrymple, prominent in the campaign for higher education for women (see text), was an institute member. See membership lists, 1868–1890, *Transactions and Proceedings of the New Zealand Institute*, vols 1–33; these appear as separate lists for each of the various constituent local societies.

93. Eileen Wallis, *A Most Rare Vision: Otago Girls’ High School—The First One Hundred Years* (Dunedin: Otago High Schools Board of Governors, 1972); John Wilson, “Scots. Otago Girls’ High School,” *Te Ara—The Encyclopedia of New Zealand*, online ed., updated 11 July 2005, www.teara.govt.nz/NewZealanders/NewZealandPeoples/Scots/en (June 2009). The Dunedin school’s opening date of 1871 is eight years earlier than that

of the first state secondary school for girls in Australia, the Advanced School for Girls in Adelaide (see the Australia chapter, above).

94. Several of the new state girls' schools recruiting well-educated women graduates as founding principals and senior teachers brought in women from Britain, as well as appointing first-generation New Zealand University graduates (see Kay Morris Matthews, "'Imagining Home': women graduate teachers abroad 1880–1930," *History of Education* 32, no. 5 (2003): 529–45). KATHERINE BROWNING (1864–1946), one of the British women who migrated to New Zealand, is of interest here since her 1892 paper in the *Transactions and Proceedings of the New Zealand Institute* was one of the four papers by women in New Zealand indexed in the Royal Society's *Catalogue*. The daughter of businessman James Terry Browning and his wife, Hannah, née Ransome, she was born in Oxford on 28 February 1864. After attending a private boarding school for girls in Reading, Berkshire, she entered Girton College, Cambridge, in 1883 and had completed the Moral Science Tripos course by 1886, although illness prevented her from taking the examinations. For a period in 1887 she held an assistant mistress post at Ramsgate High School, a Church of England-affiliated school in Ramsgate, Kent. However, the following year she emigrated to New Zealand to a teaching position at Napier Girls' High School in the small town of Napier in the Hawke's Bay region, where Newnham College-educated Mary Elizabeth Hewitt had filled the post of founding principal from 1884. Katherine, most likely the first Girton College woman to teach in New Zealand, was assistant mistress (mathematics) at Napier Girls' High School from 1888 until 1895, when she moved to Otago Girls' High School. By then she had concluded that her Cambridge qualification, which was not formally a baccalaureate degree, placed her at a disadvantage relative to University of New Zealand graduates in matters of pay and promotions in the New Zealand state school system. When she attempted to have her Cambridge qualification converted to a University of New Zealand B.A. in 1892, she was not successful, despite strong support from Cambridge graduate William Steadman Aldis, then professor of mathematics at Auckland University College (see the section on Mary Aldis, above). By 1892, relations between Katherine Browning and her principal at Otago Girls' High School, Maria Marchant, a University of New Zealand graduate, had become so strained that she resigned, either then or a short time later. In 1906 she was granted a Trinity College, Dublin, M.A. degree on the basis of her completion of the Cambridge Tripos course (see also the section on Annie Whitelaw, below). She may have taught for a time, about 1905, at a small private school in Dunedin but by 1907 had resigned from her New Zealand teaching posts and was a lecturer and local organizer for the Theosophical Society in New Zealand. By 1909 she had been selected for Theosophical Society service in India, where she taught for a number of years at a school for girls in Banaras (Varanasi); this was probably the Central Hindu School for Girls established in 1904 (see also note 148, below). After retiring, Katherine Browning returned to England, where she worked with the Vegetarian Society, the Non-Smokers' Union, and the Howard League for Penal Reform, founded in 1866, the first reform charity in any country. She was also an energetic campaigner for women's suffrage, especially in her younger days.

An ordinary member of the Hawke's Bay section of the New Zealand Institute in 1893, she transferred to the Otago section after moving to Dunedin and kept the membership until at least 1901. Her paper read before the Hawke's Bay section in July 1892 and published in the New Zealand Institute's *Transactions and Proceedings* the following year reported two observations touching on the physiology of vision (see bibliography). She discussed the phenomenon of "after-images," that is, the persistent, delayed effect produced by looking, with more than a passing glance, at a bright object with the naked eye. A second paper, read before the Otago Philosophical Institute nine years later, reported her experience as a volunteer helper with the Charity Organization Society, London ("On charity organization," *Transactions and Proceedings of the New Zealand Institute* 34 [1901]; the paper aroused considerable interest among the institute members). Other publications included contributions to the magazine *Theosophy in New Zealand* in 1908 and 1909, *Notes and Index to the Bhagavad Gîtâ* (London: Theosophical Publishing House, 1916), *A Summary of the Work of Pandit Bhagavan Das . . .* (London: Theosophical Publishing House, 1925), and the theosophical pamphlet *Lemuria and Atlantis, Two Lost Continents: Aryan Migrations* (London: Theosophical Publishing House, n.d.). Katherine Browning died on 13 April 1946 at the age of eighty-two.

95. Dorothy Page, "The first lady graduates: Women and degrees from Otago University, 1885–1900," in *Women in History* 2, ed. Barbara Brookes, Charlotte Macdonald, and Margaret Tennant (Wellington: Bridget Williams Books, 1992), 98–128.

96. Mavis Airey, "Margaret Cruickshank, 1873–1918; Christina Cruickshank, 1873–1939," in *Book of New Zealand Women: Ko Kui Ma Te Kaupapa*, 159–61; Page, "First lady graduates," in *Women in History* 2, 98–128. I am especially grateful to Vivianne Murphy, principal of Wanganui Girls' College, and Loretta Gully, college librarian, for a collection of material on Christina Cruickshank, mostly from the college's magazine, *The Adastrian*, for the years 1911 to 1939 and 1947. Special thanks also to Barbara Clark, archivist, Southland Girls' High School, for a copy of the reminiscences she collected from lawyer George Cruickshank, a nephew of Christina Cruickshank, shortly before his death.

97. Airey, "Margaret Cruickshank, 1873–1918; Christina Cruickshank, 1873–1939," in *Book of New Zealand Women: Ko Kui Ma Te Kaupapa*, 159–61; Page, "First lady graduates," in *Women in History* 2, 98–128.

98. Patricia A. Sargison, "Siedeberg, Emily Hancock 1873–1968," in *Dictionary of New Zealand Biography*, online ed., updated June 2007, www.dnzb.govt.nz (Aug. 2007); Page, "First lady graduates," 98–128; Wallis, *Most Rare Vision*, 60; Anon., "Obituary," *New Zealand Medical Journal*, 68, no. 434 (1968): 39.

99. One of several government hospitals in major cities run by midwives, St. Helen's Maternity Hospital, Dunedin, provided subsidized care for working class women until the 1930s; see www.ksmidwifery.co.nz/history.shtml (June 2009).

100. Opened in 1869 at Lookout Point, Dunedin, Caversham Industrial School, a government institution, cared for young children and those old enough to begin trades apprenticeships or domestic work. By 1904 the school was responsible for 539 children, although by then many were boarded out or in service as domestic or farm workers. Throughout the 1920s the institution was one of only two New Zealand long-term residential homes for young boys, girls, and young women, including "delinquent" girls. See "Orphanages and Children's Homes in Otago and Southland," www.library.otago.ac.nz/pdf/Hocken%20Orphanages%20Guide%20Jan07.pdf (June 2009). Emily Siedeberg also worked closely with the Plunket Society, the Royal New Zealand Society for the Health of Women and Children. Founded in 1907, the society remains very active throughout New Zealand. See www.plunket.org.nz (June 2009).

101. Airey, "Margaret Cruickshank, 1873–1918; Christina Cruickshank, 1873–1939," 159–61; Page, "First lady graduates," 98–128; Anon., Obituary, "Dr. Margaret Cruickshank," *New Zealand Medical Journal* (December 1918): 227; Anon., "Dr. Margaret Barnett Cruickshank M.D.C.M.," document 166748, Timaru District Council website, www.timaru.govt.nz/pdf/hall_fame/cruickshank.pdf (June 2009); Elizabeth Morrison, *Dr. Margaret Barnett Cruickshank. M.D.: First Woman Doctor in New Zealand* (Christchurch: Whitecombe and Tombs, 1923). Morrison's thirteen-page tribute, said to have been commissioned by the people of Waimate, contains three fine photographs, one of which shows the full-length, white marble memorial statue of Margaret Cruickshank. I thank Barbara Clark, archivist, Southland Girls' High School, for a copy of this work and also for a copy of the reminiscences of George Cruickshank (see note 96).

102. Kathleen Anderson, "Frost, Constance Helen 1862/63?–1920," in *Dictionary of New Zealand Biography*, online ed., updated 22 June 2007, www.dnzb.govt.nz/ (Sept. 2007); Anon., Obituary, "Dr. Constance Frost," *New Zealand Medical Journal* 19 (February 1920): 28; private information from Joan Dodd, Auckland. See also Kathleen Jane Anderson, "Beyond the pioneering woman doctor: A study of woman doctors in Auckland, 1900–1960," M.A. (history) thesis, University of Auckland, 1992.

103. R. Hanna, "Life in 1900—Dr. Alice Horsley, Auckland's first woman doctor," *Historical Journal; Auckland-Waikato* 32 (1978): 29–30; Kathleen Anderson, "Horsley, Alice Woodward, 1871–1957," in *Dictionary of New Zealand Biography*, online ed., updated June 2007, www.dnzb.govt.nz (Sept. 2007); Page, "First lady graduates," 98–128.

104. The 1900 outbreak of bubonic plague caused deaths in a number of Pacific port cities, including San Francisco, Honolulu, and Sydney. Thanks to stringent controls and sanitation measures, only one death occurred in Auckland.

105. Elizabeth M. Waddington, "Cowie, Helen Stephen 1875–1956," in *Dictionary of New Zealand Biography*, online ed., updated 22 June 2007, www.dnzb.govt.nz (Sept. 2007); Page, "First lady graduates," 98–128; "Cowie, James Alexander, 1874–1941 (YB019)," in National Register of Archives and Manuscripts, online index, www.nram.govt.nz/record.php?id=11789 (April 2009); "Baird, Helen Stephen (Cowie), 1875–1956 (Y3020)," in National Register of Archives and Manuscripts, online at www.nram.govt.nz/record.php?id=11790 (April 2009); "Baird, Rev. James," *Register of New Zealand Presbyterian Church Ministers, Deaconesses and Missionaries from 1840*, <http://archives.presbyterian.org.nz/Page148.htm> (Sept. 2007). See also Elizabeth Waddington and Susan Maclean, *The Bairds of Winton: The Children of James and Elizabeth Baird* (Masterton, NZ: E. Waddington, 2005), 198 pp., illus. I am especially grateful to Barbara Clark, archivist, Southland Girls' High School, for short extracts from this work. Additional sources include Gordon Cowie, *The Life and Times of a G.P.* (Waikanae: Heritage Press, 1989), 263 pp.

106. Helen Baird's mother, Jessie Elizabeth Stephen, came of a most illustrious ancestral line. The Stephens' roots have been traced back through fourteenth-century King Robert the Bruce to ninth-century Rognvald the Viking, Jarl of the Orkney Islands, and according to some of the sagas, father of Rolf the Ganger, founder of Normandy and ancestor of William the Conqueror. See "Genealogical Research," carried out by Helen Stephen Cowie; web transcription by Robert John Usher-Somers, <http://freepages.genealogy.rootsweb.com/~ushersomers/Bruce.html> (June 2009).

107. Agnes Baird, a young woman of notable intellectual ability and creative drive, left an unfinished novella, *Tempered with Fire*, whose first chapter is reproduced in Waddington and Maclean, *Bairds of Winton*.

108. William Stephen Baird (1873–1948), an eye specialist, served in France in 1915–1916, in German Samoa in 1917 (following the capture of the islands by the New Zealand Expeditionary Force in 1914), and also in Trentham and Featherstone military camps (both near Wellington). John Bruce Baird (1885–1970), on the staff

of the Twenty-fourth General Hospital with the British Expeditionary Force, was mentioned in dispatches and awarded the Military Cross after the battle of Loos, the British part of the joint British-French offensive in Artois in September 1915; British losses there reached fifty thousand. Following his return to New Zealand after the war he had charge of Westland Hospital for ten years but in 1932 went back to Britain. General surgeon at Selly Oak Hospital, Birmingham, for a number of years, he was then surgeon to the Austin Motor Company until retiring at the age of eighty.

109. I thank Ali Clarke, Hocken Library Archives, University of Otago, for helpful information about Josephine Rich, much of it extracted from the *Otago Witness*, 30 August 1894, 27; Howard Barraclough Fell, "Parker, Thomas Jeffery, F.R.S.," in *Te Ara—The Encyclopedia of New Zealand*, online ed., updated 18 September 2007, <http://www.teara.govt.nz/1966/P/ParkerThomasJefferyFr/en> (June 2009); Patricia Morison, "Haswell, William Aitchison (1854–1925)," in *Australian Dictionary of Biography*, vol. 9 (1983), 226–27.

110. See note 83 and Anon., "History of the University of Otago."

111. W. J. Gardner, E. T. Beardsley, and T. E. Carter, *A History of the University of Canterbury 1873–1973* (Christchurch: University of Canterbury, 1973); James Hight and Alice F. M. Candy, *A Short History of the Canterbury College: With a Register of the Graduates and Associates of the College* (Auckland, Christchurch, and London: Whitcombe and Tombs, 1927).

112. The community's leading citizens typically sent their sons back to England for their university education.

113. One of these students was Ernest Rutherford, later Lord Rutherford of Nelson (1871–1937), winner of the 1908 Nobel Prize in physics. He received his M.A. with first-class honors in mathematics and mathematical physics from Canterbury College in 1894 before going on to Cambridge University.

114. Helen Connon (1857–1903), later Macmillan Brown, was the second child of George Connon, a carpenter from Wales, and his wife, Helen, née Hart, who came from Scotland. Helen was born in Melbourne and spent her earliest years in the gold towns of Victoria. Following the family's move to Dunedin about 1862, Mrs. Connon, who had realized that Helen was an exceptionally bright child, paid special attention to her education. By the time Helen was about eight, the Connons had moved to Hokitika, at that time a major gold town on the west coast of the South Island. Mrs. Connon persuaded the headmaster of a boys' school there to accept the girl; within a few years Helen was helping with the teaching. By 1874 the family was living in Christchurch, where Mrs. Connon enlisted the help of her fellow Scot, John Macmillan Brown (1845–1939), in continuing her daughter's education. Recently appointed professor of classics and English at Canterbury College, Macmillan Brown, a man with tremendous drive and notable academic and administrative abilities, had an enlightened attitude toward the education of women. Helen Connon entered Canterbury College as a matriculated student in 1876. Macmillan Brown fully supported her through her college years and in her subsequent career.

After receiving her B.A. degree in 1880, Helen continued her studies and in 1881 was awarded an M.A. with first-class honors in English and Latin. Hers was the first honors degree awarded to a woman in the British Empire. A year later she became the second principal of Canterbury Girls' High School, where she had taught English, mathematics, and Latin since 1878. She married Macmillan Brown in 1886. Poor health, brought on by overwork and strain, caused her to give up her professional work in 1894, but during her twelve years as principal she established Canterbury Girls' High School as a leading academic, secondary institution with a high standard of scholarly teaching. She died in Rotorua, North Island, on 22 February 1903, leaving two daughters, ages fifteen and five. Funds to establish a number of scholarships known as the Helen Macmillan Brown bursaries were bequeathed to the University of Canterbury by John Macmillan Brown; her name is also commemorated in the Helen Connon residence hall for women students. See Cherry Rankin, "Brown, John Macmillan 1845–1935," in *Dictionary of New Zealand Biography*, online ed., updated 22 June 2007, www.dnzb.govt.nz/ (Oct. 2007), and "Connon, Helen 1859/60?–1903," *Dictionary of New Zealand Biography*, online ed., (Nov. 2007); "Brown, Helen Macmillan," in *Te Ara—The Encyclopedia of New Zealand*, online ed., updated September 2006, www.teara.govt.nz/1966/B/BrownHelenMacmillan/en (June 2009); Gardner, Beardsley, and Carter, *History of the University of Canterbury*, 156–58; see also the recent biography, *Easily the Best: The Life of Helen Connon, 1857–1903*, by Christchurch writer Margaret Lovell-Smith (Christchurch: Canterbury University Press, 2004).

115. Another of the earliest women liberal arts graduates of Canterbury College who deserves brief mention here, even though she is remembered as a writer rather than an educationalist, is Edith Searle, later Grossmann. Edith Howitt Searle (1863–1931) was born on 8 September 1863 in Beechworth, northeastern Victoria, a gold-mining center in the 1850s. Her father, George Searle, was a newspaper editor. The family moved to New Zealand in 1878. Edith attended Christchurch Girls' High School, where Helen Connon, by then on the school staff, took a special interest in her. She was awarded a B.A. by Canterbury College in 1884, followed in 1885 by an M.A. with first-class honors in Latin and English and third class in political science. She taught at Wellington Girls' High School until 1890, when she married Joseph Penfound Grossmann (1863–1944?), an Australian whom she had known as a fellow student at Canterbury College.

During the early 1890s, when she lived in Christchurch, Edith was much involved in the suffrage movement and, after New Zealand women won the vote in 1893, in the campaigns to bring equal rights and opportunities to women in other spheres as well; she was a founding member of the Canterbury Women's Institute, Christchurch section, organized in 1892 to promote women's rights. In her fiction writing, which began in 1890, she developed ideas on such matters as women's education and the role of women in marriage. By 1897 she had returned to Wellington, where she tutored university students. Some time in the early 1900s she took her only child, a retarded boy, to England for treatment and is thought to have suffered a period of mental instability herself. During the ten years she spent overseas she wrote as a freelance journalist for New Zealand and occasionally British newspapers and magazines such as the *Contemporary Review*, London, the *Auckland Star*, and the *New Zealand Illustrated Magazine*; her subjects ranged from Maori education to literary criticism. In her last novel, *The Heart of the Bush* (1909), set in the alpine foothills of the South Island, she sought to resolve some of the issues raised in her earlier works, particularly the role of women in marriage in a colonial society. After returning to New Zealand, she settled in Auckland, but within a few years her already troubled marriage was beset by further difficulties. She died in Auckland on 27 February 1931, in her sixty-eighth year. Her writings have remained subjects of considerable interest in critical analyses of New Zealand feminist literature and the New Zealand settler narrative. See for instance Sandra Coney, "Novels of the New Zealand woman: Women in revolt; the work of Edith Searle Grossmann," in Sandra Coney, *Standing in the Sunshine: A History of New Zealand Women since They Won the Vote* (Auckland: Penguin, 1993). For a short biography of Edith Searle Grossmann see Heather Roberts, "Grossmann, Edith Searle (1863–1931)," in *Dictionary of New Zealand Biography*, online ed., updated June 2007, www.dnzb.govt.nz/ (Feb. 2008).

116. Joy Marriott Marshall received a B.A. in 1889 and an M.A. with first-class honors in mathematics in 1890; Agnes Elizabeth Tindel, later McAlister, was awarded a B.A. in 1890 and an M.A. with honors in mathematics and mathematical physics in 1891. Both went on to teaching careers. See Hight and Candy, *Short History*, 187, 194–95.

117. I thank especially Ali Clarke, Hocken Library Archives, University of Otago, for information from the newspaper *Otago Witness*, 26 February 1881, 10, and Lyn Gifford, Christchurch city librarian, who sent me copies of sections from the "Register of St. Bartholomew's Kaiapoi Anglican Church. Baptisms, 1855–1876" and the marriage register of St. Mary's Anglican Church, Addington, Christchurch. Jill Durney, Macmillan Brown Library, University of Canterbury; Lynne Smith, secretary, Christchurch Girls' High School; and Jane Teal, diocesan archivist, Anglican Diocese, Christchurch, also provided much-appreciated assistance. Additional sources include Donald Newell Hawkins, *Rangiora: The Passing Years and People in a Canterbury County Town* (Rangiora: Rangiora Borough Council, 1983), 400, 412–13, 456–57; "History of Law at the University of Canterbury," www.laws.canterbury.ac.nz/history.shtml; Christchurch Cemeteries Database, <http://librarydata.christchurch.org.nz/cemeteries/interment.asp?id=97271> and <http://librarydata.christchurch.org.nz/cemeteries/interment.asp?id=97191> (all June 2009).

118. See note 114.

119. Eric Low, "Dohrmann, Elsie 1875–1909," in *Dictionary of New Zealand Biography*, online ed., updated 7 July 2005, www.dnzb.govt.nz (Jan. 2006).

120. See note 114.

121. E. J. Godley, "Biographical Notes (31); Arthur Dendy, D.Sc. (Manchester), Hon. Mem. N.Z. Inst., F.L.S., F.R.S. (1865–1925)," *New Zealand Botanical Society Newsletter* 53 (1998): 25–27.

122. A second group of vegetable sheep belong to the genus *Raoulia*; see the section on botanical artist Georgina Hetley, above.

123. Although degrees were awarded by the University of New Zealand, honors examinations were set and candidates' papers marked in Britain. This system of external examinations, which lasted for several decades, caused long waits before results arrived back in New Zealand.

124. Witold V. Lazniewski, "Beiträge zur Biologie der Alpenpflanzen," *Flora* 82, Hf. iii (1896): 224–67, doctoral dissertation, University of Munich (1896).

125. See Hight and Candy, *Short History*, 187, 218.

126. Hight and Candy, *Short History*, 185.

127. Hight and Candy, *Short History*, 216; membership lists, Philosophical Institute of Canterbury, 1904–1906.

128. Hight and Candy, *Short History*, 228.

129. Hight and Candy, *Short History*, 248; J. S. Guest, "MacCallum, Sir Peter (1885–1974)," in *Australian Dictionary of Biography*, vol. 15 (2000), 165–67; Malcolm Wilson, obituary [for Mrs. Bella Dytes MacIntosh MacCallum], *Proceedings of the Linnean Society*, (1930–31): 180–81; membership lists, Philosophical Institute of Canterbury, 1908–1924; Ray Desmond, *British and Irish Botanists and Horticulturalists* (London: Taylor

and Francis, 1977), 403; information from Jill Durney, Macmillan Brown Library, University of Canterbury. The award of the D.Sc. degree to Bella Jennings, née Cross, is listed in the *New Zealand University Calendar, 1920–1921*, but is not mentioned in her entry in Hight and Candy, *Short History*, 248.

130. B. D. Cross, “Observations on some New Zealand halophytes,” *Transactions and Proceedings of the New Zealand Institute* 42 (1909): 547–74.

131. B. D. Cross, “Investigations on *Phormium*,” *Transactions and Proceedings of the New Zealand Institute* 47 (1914): 61–66.

132. L. S. Jennings, “Revision of the *Cirripedia* of New Zealand,” *Transactions and Proceedings of the New Zealand Institute* 50 (1918): 53–63. The report was communicated to the Philosophical Institute of Canterbury in 1917 by Charles Chilton.

133. B. D. MacCallum, “Some wood-staining fungi,” *Transactions of the British Mycological Society* 7 (1922): 231–36.

134. Hight and Candy, *Short History*, 105, 125, 231–32; information from Jill Durney, Macmillan Library, University of Canterbury; “Philosophical Institute of Canterbury, Proceedings,” in *Transactions and Proceedings of the New Zealand Institute*, (1920, 1921): 52, 53.

135. E. M. Herriott, “On the leaf-structure of some plants from the southern islands of New Zealand,” *Transactions and Proceedings of the New Zealand Institute* 38 (1905): 377–422.

136. Leonard Cockayne, “A botanical excursion during midwinter to the Southern Islands of New Zealand,” *Transactions and Proceedings of the New Zealand Institute* 36 (1903): 225–333; Thomas Kirk, “On the botany of Antipodes Islands,” *Transactions and Proceedings of the New Zealand Institute* 23 (1890): 436–41.

137. E. M. Herriott, “Notes on the occurrence and habits of the fresh-water crustacean *Lepidurus viridis* Baird,” *Transactions and Proceedings of the New Zealand Institute* 49 (1916): 284–92.

138. E. M. Herriott, “A history of Hagley Park, Christchurch, with special reference to its botany,” *Transactions and Proceedings of the New Zealand Institute* 57 (1919): 427–47.

139. Arnold Wall’s botanical publications included the short book *The Botany of Christchurch* (Christchurch: Lyttleton Times, 1922; Wellington: A. H. and A. W. Read, revised, 1953).

140. E. M. Herriott, “Some morphological notes on the New Zealand giant kelp, *Durvillea antarctica* (Chamisso),” *Transactions and Proceedings of the New Zealand Institute* 54 (1923): 549–64.

141. Hight and Candy, *Short History*, 105, 125, 279.

142. Sinclair, *University of Auckland*.

143. Sinclair, *University of Auckland*; K. A. Trembath, *Ad Augusta: A Centennial History of Auckland Grammar School, 1869–1969* (Auckland: Auckland Grammar School Old Boys’ Association, 1969); Ian Cumming and Alan Cumming, “The foundation years of Auckland Girls’ Grammar School,” *New Zealand Journal of Educational Studies* 6, no. 2 (1971): 101–12.

144. Ruth Fry, “Stothard, Sarah Sophia 1825/1826?–1901,” in *Dictionary of New Zealand Biography*, online ed., updated 22 June 2007, www.dnzb.govt.nz (Sept. 2007).

145. Frances Shayle George (1827–1829?–1890), née Southwell, was a notable figure in the movement for girls’ education in Auckland in the 1870s. A teacher herself and an articulate spokeswoman for the cause, she wrote letters to Auckland newspapers and presented her arguments and ideas at meetings of Auckland educational organizations. She was a member of both the Auckland Education Society and the Auckland Teachers’ Association and was not without influence among Auckland’s political leaders. Her twelve-page essay, *Education of Girls: read before the Auckland Teachers’ Association, 20 June 1874*, was published in 1874 (Auckland: Upton & Co., William Atkin). The daughter of John Southwell, a solicitor, and his wife, Martha, she was born in the late 1820s in the affluent community of Clifton, part of the city of Bristol from the 1830s. In 1848 she married Thomas Shayle George, also a solicitor, and with him and the first of her five children emigrated to New Zealand in 1850. Two years later she opened a primary school in her family home in the Mount Eden district of Auckland and also began writing. Her account of the voyage out and her new life in New Zealand, “From a settler’s wife,” appeared in 1852 in the London magazine *Household Words*, a popular periodical edited by Charles Dickens that was published between 1850 and 1859; a collection of her poems, *A Shell from the South Pacific*, was brought out in 1855 in aid of an Auckland fund for the families of British soldiers killed in the Crimean War. In 1867 she started a school for girls, which within a few years became the largest and best-known of the private, academically sound schools in Auckland for girls of the middle classes. A proposal she brought forward in 1874 that the provincial council establish a central high school for girls included the suggestion that such a school would function as a training college for women teachers. Later that year the local Education Act was amended to provide the necessary funds, and in 1877 Auckland Girls’ High School (the predecessor of Auckland Girls’ Grammar School) opened its doors. Believing that women should be able to support themselves and their dependents if necessary, she had no doubts about the need for educational reform; on the other hand, her conservative views on woman’s

proper sphere in society led her to reject the idea of equal rights. Little is known of her life after her public work in the 1870s. Her husband does not appear to have been successful professionally in Auckland; by the 1860s he had moved to the United States, where he died (in Rock Island, Illinois) in 1868. Frances died in Auckland on 8 September 1890. See Raewyn Dalziel, "George, Frances Shayle 1827–1829?–1890," in *Dictionary of New Zealand Biography*, online ed., updated 22 June 2007, www.dnzb.govt.nz (Oct. 2007).

146. The first woman in the British Empire to be awarded a university degree is thought to have been Grace Annie Lockhardt, who received a B.Sc. from Mount Allison University, Sackville, New Brunswick, in 1875, two years before Edger was awarded her University of New Zealand B.A. The B.Sc. degree was not approved by the University of New Zealand until 1885; Auckland University College began preparing students for it in 1887 (see Sinclair, *University of Auckland*, 32).

147. Beryl Hughes, "Edger, Kate Milligan 1857–1935," in *Dictionary of New Zealand Biography*, online ed., updated 22 June 2007, www.dnzb.govt.nz (Sept. 2007), and "Kate Edger," in *Book of New Zealand Women: Ko Kui Ma Te Kaupapa*, 201–4.

148. Margaret Lilian Florence Edger studied at Auckland University College, concentrating on mathematics, from 1878 to 1880, when she transferred to Canterbury College. She was awarded a B.A. in 1881 and an M.A. with first-class honors in Latin and English in 1882. After short periods of teaching at Christchurch Girls' High School and Nelson College for Girls, she became headmistress of Ponsonby College for Girls, Auckland. She was also a member of the lay council of Auckland University College, and she supported mathematics professor William Steadman Aldis against the powerful council chairman Sir Maurice O'Rorke in the serious dispute between Aldis and O'Rorke (see the section on Mary Aldis, above, and Sinclair, *University of Auckland*). About 1892, inspired by the teachings of Annie Besant and others, Lilian Edger and two of her sisters, Mrs. Hemus and Mrs. Judson, joined the New Zealand Section of the Theosophical Society. An enthusiastic worker, she became the section's first general secretary four years later, and her outstanding success as a lecturer led to her being selected in 1897 for service in India. Between 1913 and 1919 she held the post of principal of Central Hindu School for Girls, an institution founded by Annie Besant and connected to Central Hindu College, Banaras (now Varanasi), Uttar Pradesh. From 1919 until at least 1927 she was English teacher to the sons of the Maharajah Bahadur of Darbhanga, a city in the state of Bihar, northwest India. She published various papers and lectures on theosophy, the best-known being her introductory work, *Elements of Theosophy* (London: Theosophical Publishing House, 1903, 1907; Dutch tr. *Grondbeginselen der Theosofie*, Amsterdam: Theosofische Uitgeversmaatschappij, 1906, 1921, trans. W. E. Asbeek Brusse). Her lecture collections include *Indian Tour Lectures* (Madras: n.p., 1899) and *Gleanings from Light on the Path: Four Lectures . . . Adyar 1908* (Madras: Theosophical House, 1909). See Hight and Candy, *Short History*, 177–78; "Theosophical Society in New Zealand: The History of Theosophy in Auckland," www.theosophy.org.nz/branches/HPB/onehund.html (June 2009).

149. See note 114.

150. Membership lists, Philosophical Institute of Canterbury, 1868–1900, in *Transactions and Proceedings of the New Zealand Institute*, vols 1–33.

151. Samuel Edger, *Autobiographical Notes and Lectures*, ed. Kate M. Edger and Lilian Edger (London: W. Isbister, 1886).

152. See also the section on Mary Aldis, above.

153. Margaret A. E. Hammer, "Whitelaw, Annie Watt (1875–1966)," in *Oxford Dictionary of National Biography*, 2004, online ed., www.oxforddnb.com.www2.lib.ku.edu:2048/view/article/70074 (Oct. 2007); Trembath, *Ad Augusta: A Centennial History*, 143; Kay Morris Matthews, "Boundary crosser: Anne [sic] Whitelaw and her leadership role in girls' secondary schooling in England, New Zealand and East Africa," *Journal of Educational Administration and History* 37, no. 1 (2005): 39–54; information from Mrs. Tina Cunningham, librarian and archivist, Wycombe Abbey School, Buckinghamshire.

154. See section on Mary Aldis, above.

155. Creese, *Ladies in the Laboratory?* 189–96.

156. Dame (Jane) Frances Dove (1847–1942), a leading figure in the effort to improve secondary education for girls in late nineteenth-century Britain, was the eldest of ten children in the family of Rev. John Dove and his wife, Jane Ding, née Lawrence. Born in Bordeaux, France, on 27 June 1847, she grew up in London, where she came into contact with the family of Emily Davies and others who were much engaged in the current debate on women's education. She was taught at home by her father for a time and then attended Queen's College, Harley Street, for three years. When her father became vicar of the isolated fen village of Cowbit, Lincolnshire, in 1862, her formal education was temporarily interrupted. Nevertheless she studied on her own, prepared for university entrance examinations, and in 1871 enrolled at Girton College, the new college for women then led by Emily Davies. Concentrating on the natural sciences, she passed the tripos examinations at the ordinary degree standard in 1874.

After eight years of teaching at Cheltenham Ladies' College, Frances Dove became headmistress of St. Andrews School for Girls, Fife, which soon after her appointment moved to a new building and was renamed St. Leonards; before she resigned in 1895, the reputation of St. Leonards for academic excellence was well established. Inspired to start an English version, she succeeded in raising the necessary funds and opened Wycombe Abbey School in 1896. What the great public schools gave boys, Frances Dove sought to provide for girls, with suitable modifications. Academic standards were set high, participation in team sports was compulsory, and life for the girls was relatively spartan. A major emphasis was placed on community and welfare work at home and mission services overseas; the school's basic underlying aim was education for good citizenship. After retiring in 1906, she stood for election to High Wycombe town council, but by about 1913 reaction to the growing suffragette movement told against her, and she lost her seat. Thereafter she occupied herself with voluntary work for the Anglican Church and the county education committee. A justice of the peace for Buckinghamshire in 1921, she was created DBE (Dame Commander of the British Empire) in 1928. She served on Girton College Council for twenty-two years (1902–1924) and after that became a life governor. Dame Frances died at her home in High Wycombe on 21 June 1942, six days before her ninety-fifth birthday. See Kate Perry, "Dove, Dame (Jane) Frances (1847–1942)," in *Oxford Dictionary of National Biography*, 2004, online ed., [www.oxforddnb.com.ww2.lib.ku.edu:2048/view/article/32880](http://www.oxforddnb.com/ww2.lib.ku.edu:2048/view/article/32880) (Sept. 2007).

157. Matthews, "Boundary crosser," 48–49.

158. These memoranda, submitted to the Colonial Office African education group between 1925 and 1927, are included in "The Joint International Missionary Council and Conference of British Missionary Societies Archives: Africa and India, 1910–1945." Original manuscripts are housed in the School of Oriental and African Studies, London; a microfiche edition, "International Missionary Council, Conference of British Missionary Societies, University of London, School of Oriental and African Studies," was brought out in 1977 (Zug: Inter Documentation Co. AG). Annie Whitelaw's notes, reports, and correspondence include: "Education of women and girls" and "Education of girls—Uganda" (mf. 79); "Tanganyika" (mf. 80); "Education of girls—Uganda" (mf. 140); Memorandum on Training of Teachers—based on notes by Whitelaw (mf. 149); Notes on Memorandum on Training of Native Teachers [committee document] (mf. 150–151); File—Miss Whitelaw, April 1926 / October 1927. Correspondence re. travel in Africa, appointment to Advisory Committee, possible appointment to Selly Oak, etc. (mf. 233–234); ACEC 9/31: Advisory Committee . . . Memorandum by Miss Burstall & Miss Whitelaw on Education of African women 16.5.31 (mf. 295); Education of girls: Uganda—notes in answer to a letter from Mr. Hussey, D. of E., Uganda (mf. 398). I thank especially Toby Burrows, archives librarian, Scholars' Centre, University of Western Australia Library, for help and detailed information on Whitelaw's reports.

159. The Selly Oak Centre for Mission Studies, a theological training center, is one of a number of theological training colleges, collectively called the Selly Oak Colleges, now part of the University of Birmingham (see www.queens.ac.uk/mission/ [June 2009]).

160. Ann Courthoys, "Bennett, Agnes Elizabeth Lloyd (1872–1960)," in *Australian Dictionary of Biography*, vol. 7 (1979), 265–66; Beryl Hughes, "Bennett, Agnes Elizabeth Lloyd 1872–1960," in *Dictionary of New Zealand Biography*, online ed., updated 22 June 2007, www.dnz.govt.nz/ (Oct. 2007), and "Agnes Bennett, 1872–1960," in *Book of New Zealand Women: KoKui Ma Te Kaupapa*, 79–81; John Sidney Gully, "Bennett, Agnes Elizabeth Lloyd, O.B.E.," in *Te Ara—The Encyclopedia of New Zealand*, online ed., updated 18 September 2007, www.teara.govt.nz/1966/B/BennettAgnesElizabethLloydObe/en (June 2009).

161. See also note 99.

162. All three of these Clyde-built ships, owned by New Zealand shipping companies, survived the First World War. The *Wiltshire*, built in 1912 as a passenger and cargo carrier, was in use by at least 1916 as a troopship. En route from Liverpool to Auckland with general cargo in 1922, she was wrecked at Rosalie Bay, Great Barrier Island, during a storm; all 103 crew were winched ashore. (For more on Rosalie Bay see the section on botanical artist Fanny Osborne, above.) The New Zealand Shipping Company's *Paparoa*, built in 1899, rejoined the main passenger service in 1921 and lasted until 1926, when fire broke out as the vessel neared St. Helena on an outward voyage. Passengers were taken off by the P&O Line steamer *Barrabool*, which had responded to *Paparoa*'s distress signals, but attempts by a party from the cruiser HMS *Birmingham* to extinguish the fire failed; the ship was eventually scuttled. The *Essex*, built in 1902, was converted in 1919 to cargo only, sold to a Belgian company in 1927, and scrapped in 1933. See www.nzmaritimeindex.org.nz/ixsearchvessels.asp?hit=1&name=WILTSHIRE; www.petemesley.com/Wiltshire%20History.htm; www.theshipslist.com/ships/descriptions/ShipsP-Q.html; www.nzmaritimeindex.org.nz/ixsearchvessels.asp?hit=1&name=ESSEX (June 2009 for all four).

163. Gardner, Beardsley, and Carter, *History of the University of Canterbury*, Ch. 3.

Chapter Four

Canada

Prairie Grasslands, Maritime Woods, High Peaks, and Arctic Tundra

The Royal Society *Catalogue* lists pre-1901 papers by eleven women working in Canada, a group comparable in size to that found for Australia. Seven of the eleven were independent amateur collectors and observers: one from the early part of the century, two from the middle years, and four from the 1890s; the remaining four were university-trained professionals publishing in the 1890s. As in the accounts of women's contributions to science-related work in nineteenth-century South Africa, Australia, and New Zealand, a number of pioneering women in Canada, who because of the nature of their contributions are not listed in the Royal Society *Catalogue*, have been added here. The careers of a few of Canada's earliest women professional scientists whose work began in the first quarter of the twentieth century are also sketched.

Plant studies being the area of scientific activity of the earliest of the women contributors, a brief note on the historical background to the knowledge of the flora of regions in what is now Canada is perhaps of interest.¹

The first French explorations of the present Atlantic provinces and the St. Lawrence Valley are almost contemporaneous with the early Dutch visits to the Cape of Good Hope (see the South Africa section), and although the flora of Canada did not stimulate the widespread public interest in Europe that the wealth of exotics from the Cape gave rise to, French botanists slowly built up knowledge of Canadian plants from the mid-sixteenth century on. Observations were recorded by British and French settlers and by French Jesuit missionaries, apothecaries, and physician-naturalists, among whom were notable figures such as Michel Sarrazin (1659–1734), royal physician to French colonial troops in Quebec from 1697. Sarrazin observed and collected over many years, supplying a large number of plants and seeds for the Paris botanical garden, as well as herbarium specimens; his successor in Quebec, Jean-François Gaultier (1708–1756), continued the work. By the opening of the eighteenth century, the British having established a presence in both Newfoundland (to service the fishing fleet) and on the shores of Hudson Bay (to further their fur-trade interests), the first botanical specimens from these regions reached Britain. When the Seven Years' War ended in 1763 and the French North American colonies were ceded to Britain, British botanists fairly quickly started their own exploration of North American flora. In 1768 Joseph Banks (1743–1820) botanized along the shores of Newfoundland and Labrador, collecting a number of species new to science. Banks's protégé Archibald Menzies, botanist and ship's doctor, who sailed with George Vancouver in the *Discovery* expedition of 1791–1795, collected along the Pacific coast, discovering many previously unknown species; his work made a significant contribution to William Jackson Hooker's important *Flora Boreali-Americana* (1829–1840).² European studies of Arctic flora, including that of the Canadian interior, continued steadily throughout the nineteenth century; many of these studies were carried out by naturalists on major Arctic expeditions, such as those of the Royal Navy led by John Franklin in 1818–1822 and 1825–1827 and by botanists on the Hudson's Bay Company expedition of 1827.

The appearance in 1829 of the first two volumes of Hooker's flora of the northern parts of North America may also be taken as marking the beginning of significant contributions by European women to Canadian botanical studies. Hooker, then professor of botany at the University of Glasgow (and

director of the Royal Botanic Gardens, Kew, 1841–1865), had strong interests in the flora of all Britain's colonial possessions, and being a kindly, sociable man, who generously acknowledged contributions from his many collectors, he successfully enlisted the help of several women botanical enthusiasts.³

INDEPENDENT CONTRIBUTORS

Quebec and Ontario

CHRISTIAN RAMSAY, LADY DALHOUSIE,⁴ née BROUN (1786–1839), the daughter of Charles Broun and his wife, Christian, née McDowall, was born on 28 February 1786 at Colstoun, an estate near Haddington, East Lothian, Scotland, held by the Broun family since the thirteenth century. Little is known about her childhood and upbringing, but her later activities indicate that her education was not neglected and that she had a lively intelligence and broad interests. At age nineteen, in May 1805, she married Sir George Ramsay, ninth earl of Dalhousie (1770–1838), of Dalhousie Castle, the ancient seat of the Ramsay family about eight miles southeast of Edinburgh. Ramsay, who had attended the University of Edinburgh for a time, joined the army at the age of seventeen; one of the Duke of Wellington's generals in the Napoleonic wars, he was awarded a KB (King's Bench) in 1813 and a GCB (Knight Grand Cross of the Bath) in 1815 after distinguished service at the battle of Waterloo. Although he received the additional honor of being created Baron Dalhousie in 1815, the financial condition of his family estate was such that he sought a colonial appointment to preserve his military rank. He took up the post of lieutenant governor of Nova Scotia the following year; Lady Dalhousie and the youngest of her three sons sailed with him from Portsmouth on the forty-gun frigate HMS *Forth* on 11 September 1816, arriving in Halifax on 24 October.⁵

During the four years she lived in Halifax (1816–1820), Lady Dalhousie accomplished a notable amount of botanical work, in addition to conscientiously carrying out her official duties. To some extent she may have been able to combine the two by accompanying her husband on his frequent tours throughout the province to investigate the region's agricultural potential and the possibilities for improving farming practices. The collection of Nova Scotian plants she assembled formed part of a herbarium of specimens from British North America she presented to the Literary and Historical Society of Quebec in 1824.⁶ Further opportunities for botanical exploration came in 1820, when her husband became governor-in-chief of British North America and they moved to the administrative center, Quebec City. There the Dalhousies became very active in social and intellectual circles. The governor-in-chief was one of the founders of the Literary and Historical Society of Quebec, which, five years after it was established in 1824, began publishing its *Transactions*; Lady Dalhousie's catalog of about four hundred Canadian plants appeared in the first volume (see bibliography). Most were listed according to broad Linnean divisions and species name, although a few were identified by genus only. The collection itself was presented to the society.

One of the group referred to as "chatelaines of estates near Quebec City," she did not lack nearby women neighbors with whom to share her natural history interests.⁷ A number of them, several of whom supplied Hooker with specimens, lived in country houses whose grounds included extensive woodland areas where collecting could be done (see Sheppard and Perceval below); they often botanized together in natural habitats at Sillery and other localities in the vicinity of Quebec City, as well as at Sorel, the summer residence of the governor-in-chief, about forty-four miles downriver from Montreal, where the Dalhousies spent as much time as possible. Lady Dalhousie prepared a fairly large collection of herbarium sheets of Quebec plants and in addition painted a number of botanical watercolor sketches. She seems also to have shared enthusiastically in her husband's great interest in birds.⁸

Her plant identifications are considered to have been remarkably accurate in the collections examined by present-day Canadian botanists. She and her friends the Sheppards are known to have had substantial botanical libraries and may well have identified their specimens themselves. Pringle⁹ suggests that the primary reference used by these botanists was Frederick Pursh's 1813 *Flora Americae Septentrionalis*, then a standard reference for naturalists working on Canadian flora.¹⁰

Lord and Lady Dalhousie also established a botanical garden at Quebec and exchanged plants with Dalhousie Castle in Scotland. The report published by the castle gardener in 1826 provides details of this extensive and magnificent architect-designed garden, which included an area devoted to plants from Nova Scotia and Lower Canada sent home by Lady Dalhousie over several years, beginning in 1817.¹¹ The plantings included a number of rarer North American species, some of which flowered for the first time in Britain in the Dalhousie Castle gardens. Of the herbarium specimens sent to Britain by Lady Dalhousie, most have now been returned to Canada; those collected between 1825 and 1827, mostly in Quebec, are held at the Royal Botanical Gardens, Hamilton, Ontario.

In 1829, following a period of serious differences and disputes between Lord Dalhousie and the London administration, the Dalhousies left Canada. Lady Dalhousie's botanical work by no means ceased, however. Her best-known contributions are the collections she made in India between 1829 and 1832, when her husband was successively commander-in-chief and governor-general; her Indian herbarium, which included plants from the foothills region around Simla and from the island of Penang off the west coast of the Malay Peninsula, was presented to the Botanical Society of Edinburgh in 1837.¹² She also collected during brief stops in the Cape region of South Africa, in St. Helena, and in Madeira. Lady Dalhousie died in Edinburgh on 22 January 1839, less than a year after her husband. Her name is commemorated in a genus of perennial climbing shrubs, *Dalhousiea*.

HENRIETTA (HARRIET) SHEPPARD,¹³ née CAMPBELL (fl.1820s–1830s), the fourth of five children (three sons and two daughters) in the family of Archibald Campbell and his wife, Charlotte, née Saxton, was most likely born in Quebec in the late 1780s or early 1790s. Her mother's people came from a long line of New Englanders, and at the time of the American Revolution her father held extensive lands in Pennsylvania; Archibald Campbell, also a settler in colonial America, was of Scottish descent. As loyalists to the Crown, both the Saxtons and Archibald Campbell, having forfeited their property after the Revolutionary War, migrated to Nova Scotia. Soon thereafter both families moved to Quebec, where Campbell established himself in the flourishing timber export trade with Britain and amassed a considerable fortune. His children's education was not neglected; two of the sons, John Saxton and Archibald, went on to successful careers, acquired large country estates, and were notable figures in Quebec social and cultural life. Harriet also was well educated, undoubtedly benefiting from the strong interest of members of her mother's family in women's education. One might speculate that she spent some time at a ladies' school in Montreal established by her aunt, Harriet Saxton, soon after the Saxton family arrived in Quebec.

In 1809 Harriet Campbell married English immigrant William Sheppard, a Montreal merchant in the timber trade and shipbuilding business, enterprises in which, at least for a time, he worked in partnership with his brother-in-law John Saxton Campbell. Seven years after his marriage, in 1816, Sheppard acquired the property known as Woodfield, a fine country house surrounded by one hundred acres of park and woodland in the township of Sillery, just west of Quebec City. Here Sheppard, a respected naturalist, had a library of about three thousand volumes, a picture gallery, and a small natural history museum. He also established a fine garden overlooking the river and built an aviary and greenhouses. Harriet is thought to have had a large family but nevertheless joined enthusiastically in her husband's natural history interests; she was a good botanist, an excellent bird observer, and also studied shells (see bibliography).

William Sheppard played a leading role in founding in 1824 the Literary and Historical Society of Quebec, other leading figures in this organization being two of his Campbell brothers-in-law and his friend the governor-in-chief, Lord Dalhousie. Harriet also took part in the society's activities. Her extensive list of recent shells of the region, with descriptive notes that included locations where found, was originally prepared at the request of a member of the Society of Arts and Science;¹⁴ it is considered to be the earliest publication on Quebec shells. Writing three decades before the appearance of *The Origin of Species*, she followed the classification scheme proposed by Darwin's forerunner French naturalist Jean Baptiste Lamarck, whose *Histoire naturelle des animaux sans vertèbres* had recently appeared.¹⁵ She was clearly well acquainted with the Linnean system, knew much of the current literature of conchology and its vocabulary, and read French easily. Cautious in her conclusions, she noted that no reference volumes she had access to included all the species she found; Lamarck's work allowed

her to establish genus, but he did not describe many of her species. She made no claim to these being new discoveries, noting that Lamarck had described only specimens in his collection and that her “unknown” species might have been described elsewhere.

Largely passed over for a century in accounts of Canadian conchology, Harriet Sheppard’s work was brought back into the historical record by a 1935 paper that discussed her contribution in some detail, with full quotations. The author attributed the long neglect of this earliest list of Quebec shells to the fact that it was published in a periodical of limited circulation that was difficult to obtain within a short time of issue; the work was, however, “remarkably good considering the books at her disposal and the state of conchology at that time.” Thanks to Mrs. Sheppard’s descriptive notes, all her species could be identified and their 1935 name equivalents provided.¹⁶

Harriet Sheppard’s report on the North American songbirds she observed in the Quebec region was also prepared in response to a personal request for the material. Using as reference the recent publication by Alexander Wilson on North American birds, the best and most extensive work on the wild birds of eastern North America then available, she set out to add a few examples of songbirds not classed as such by Wilson, although in most cases she attributes the difference to the fact that these species do not sing when on their winter grounds in the regions Wilson visited but do so when passing through Quebec en route to their summer grounds.¹⁷ The question of whether the birds of North America sing was evidently one of much current interest to British naturalists, the late eighteenth-century French naturalist Georges Buffon having expressed the opinion that they do not. James Rennie, then professor of natural history at King’s College, London, had recently published in the *Magazine of Natural History* an article describing the songs of twenty-four American songbirds, which he hoped would adequately disprove the “untenable theories of Buffon” on the subject.¹⁸ Harriet Sheppard’s note added seven more.

Although her husband brought out a number of reports on Canadian plants in early issues of the Quebec Literary and Historical Society’s *Transactions*, Harriet Sheppard’s focus in her botanical work was on collecting only. Along with her close friends Lady Dalhousie and Anne Perceval, wives of members of the powerful “Château Clique” of Lower Canada who owned large estates outside Quebec City, she regularly went on botanizing expeditions around Sillery; these three women collected extensively for Sir William Hooker and are cited many times in his *Flora Boreali-Americana* as contributors of Canadian specimens. A fire at Woodfield in 1842 is thought to have destroyed specimens housed there.

Following serious financial losses in his timber export business in 1847, Sheppard sold Woodfield and retired to Fairymead, a residence at Drummondville on the St. Francis River about ninety miles southwest of Quebec City (figure 4.1). No information has yet been uncovered about Harriet Sheppard’s later years. After the departure from Canada of Anne Perceval in 1828 and the Dalhousies in 1829, she may well have felt somewhat cut off from women naturalist companions, although she continued her ornithological studies at least into the 1830s. Mrs. Sheppard was clearly a very competent naturalist; one might well wish she had been less reticent and published more, despite the age and customs.

ANNE MARY PERCEVAL,¹⁹ née FLOWER (1790–1876), another of the early women naturalist friends of Lady Dalhousie, was cited as the collector of about 150 species from the Quebec City region in Hooker’s *Flora Boreali-Americana*, and her contributions were acknowledged eight times in Torrey and Gray’s *Flora of North America* (1838–1843).²⁰ Born on 14 January 1790, probably in or near London, she was the oldest of the eight children of Sir Charles Flower and his wife, Ann, née Squire. The family was wealthy; Sir Charles, of Lobb, County Oxford, and Woodford, County Essex, First Baronet after December 1809, became Lord Mayor of London the same year. Being his eldest daughter, Anne, then age nineteen, assumed the role of Lady Mayoress, her mother having died six years previously. Well educated and cultured, with a working knowledge of Latin, she was a good musician and a competent artist, fluent in French and Italian.

On 6 August 1810 she married Michael Henry Perceval, a member of the family of the Earls of Egmont and a relative of Spencer Perceval, then prime minister. Appointed collector of customs for Quebec, Michael Perceval also held a seat on the Executive and Legislative Councils of Lower Canada; later he became superintendent of the Port of Quebec. In 1815 the Percevals acquired Powell Place, one of the most magnificent estates in Lower Canada. Situated in Sillery, to the west of Quebec City, the house, built in 1780 and rebuilt after a fire in 1860, later became the official residence of the governor

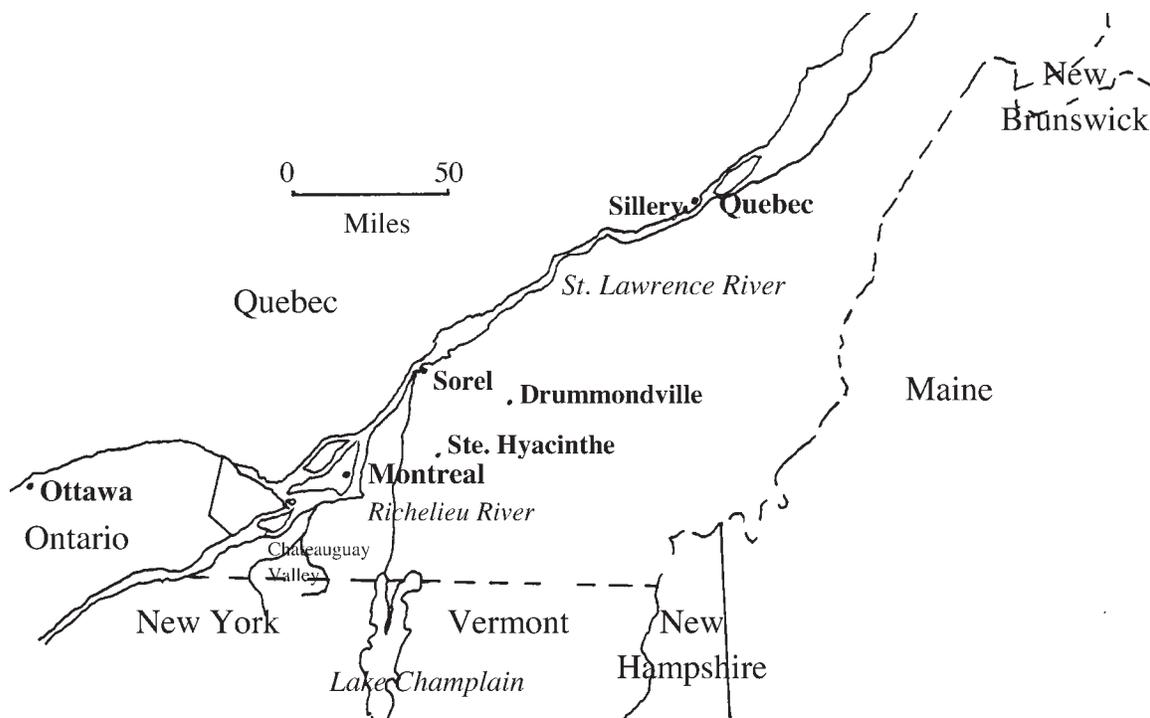


Figure 4.1. Canada: Montreal to Quebec.

of Canada. This estate of over one hundred acres, renamed Spencer Wood by the Percevals, included impressive gardens and extensive wooded tracts ideal for botanizing.

Anne Perceval was a woman of energy and vitality, with wide interests. She taught her ten children French, Italian, and Latin, as well as music and drawing, and carried out her duties as mistress of a large estate visited by Lower Canada's powerful and influential elite.

The arrival in Quebec City of Lady Dalhousie in 1820 and the close friendships she quickly developed with Anne Perceval and Harriet Sheppard awakened the interest of these latter two women in plant collecting, already an important hobby for Lady Dalhousie. She and Harriet Sheppard often came to Spencer Wood for plant-collecting expeditions, and all three also botanized in the adjacent extensive estate of Woodfield, acquired by the Sheppards in 1816.

Most of Anne's collecting was done on the grounds of Spencer Wood and Woodfield and at Marchmont, the estate of Sir John Harvey, all three properties above the high, steep banks of the St. Lawrence River, although she also obtained some wetlands species from Woodfield. A few additional species collected by her came from sites near Montreal and in Upper Canada. As well as the specimens she sent to Hooker, she prepared several albums of herbarium specimens, which have been preserved at various institutions in Canada and the United States, including the Academy of Natural Sciences, Philadelphia (about 100 specimens), West Chester University, Pennsylvania (182 specimens, including a few collected by Lady Dalhousie at Sorel), and the Biosystematics Research Center, Agriculture Canada, Ottawa. The small collection at the research center, comprising mainly plants from around Sillery and dated 1820, is currently thought to be the oldest series of Canadian plant specimens extant in Canada, except for a few specimens held in the herbarium of Macdonald College, McGill University. She collected as many species as she could, traveling to diverse habitats to do so, and while some species from around Sillery were undoubtedly more common in that region in the 1820s than they are today, a number of her specimens, such as the orchids *Platantera blephariglottis* (Willd.) Lindl and *Arethusa bulbosa* L., are considered to have been rare in that area even then.

She left Quebec in 1828, taking her children with her, to spend a year in Florence, Italy, expecting to return. Her husband, having obtained sick leave, planned to join them in 1829, but he died at sea en

route, and the family never went back to Spencer Wood. She spent her last days at Lews Castle, Stornoway, Isle of Lewis, then the home of her fourth daughter, Mary Jane, wife of Sir James Matheson, First Baronet, who bought Lewis in 1844 and built Lews Castle.²¹ Anne Perceval died at the castle on 23 November 1876, two months before her eighty-seventh birthday. Although no species appear to have been named after her, as an early collector of significant numbers of plant specimens from Lower Canada, she is assured an honorable place in Canada's botanical history.

One of Canada's most famous writers, Catharine Traill, was an important contributor of early botanical records of southeastern Ontario.

CATHARINE PARR TRAILL,²² née STRICKLAND (1802–1899), the fifth of six surviving daughters and two sons in the family of Thomas Strickland and his second wife, Elizabeth, née Homer, was born on 9 January 1802 in London. Soon after her birth, her father, a retired shipping agent and dock manager, moved his family to Bungay in the Waveney valley, Suffolk, and a few years later to Reydon Hall, an Elizabethan mansion near Southwold on the Sussex coast. Not many country gentlemen of Strickland's time placed much importance on academic education for girls, but believing that girls should be treated the same way as boys in this matter, he taught his daughters himself, giving them a grounding in Latin and mathematics, as well as the usual subjects, such as history and geography. In the summers they collected wildflowers in the surrounding countryside and shells on the local beach; in winter they wrote stories, developing skills that several of them were to use to earn a living in future years.²³ When Thomas Strickland died in 1818, leaving his family little beyond Reydon Hall, Catharine, then age fifteen, was the first of the sisters to turn to writing to supplement their scanty resources. Over the next decade she wrote regularly for the growing London trade in books for adolescents and the increasingly popular annuals and gift books. Following the fashion of the day, she produced didactic stories providing moral instruction, or autobiographical reminiscences, at least one of which dealt with topics in natural history;²⁴ most were published anonymously.

In 1832, despite strong family opposition, she married a widower, Lieutenant Thomas Traill, heir to his heavily encumbered family estate of Westove on Sanday, one of the northerly islands of the Orkney group. Then a half-pay army officer and burdened by personal debt as well as claims on the estate, he had hopes of making a new start in Canada by taking advantage of a land grant entitlement and cheap land prices. Leaving his two sons with his deceased wife's relatives in Kirkwall, he and Catharine left for Canada soon after their marriage. They were followed the same year by Catharine's younger sister, Susanna, and her husband, John Wedderburn Dunbar Moodie, an army friend of Thomas Traill. Samuel Strickland, younger brother of Catharine and Susanna, had already emigrated to Upper Canada about seven years earlier.

The Traills settled on land at Lakefield, not far from Peterborough, about twenty-five miles north of Lake Ontario (figure 4.2), a part of the country often thought of as dense coniferous forest. In its natural state in presettler times, the Rice Lake Plains, as the region is known, was an extensive stretch of open prairie and black oak savanna that might be thought of as a northeasterly extension of the open prairie lands to the west. An especially interesting area botanically, its rich flora was distinctive; the species reported by Traill and other early botanists and explorers were, in Ontario, restricted to such regions, and many are now rare in the province. Consequently Catharine's botanical writings constitute an important historical record of the extent and floristic composition of the native plant communities in this region.²⁵

During his first seven years in Canada, Thomas Traill attempted to establish his farm on his land grant near Lakefield, but despite initial help from his brother-in-law Samuel Strickland, whose property was nearby, Traill, lacking any experience as a farmer, had a difficult time trying to adapt to the relative isolation and the unexpected severity of settler life; he was subject to continual bouts of depression and never achieved the success of Samuel Strickland, who became one of Lakefield's leading farmers and developers. In 1839 Traill sold the property and moved his family to Peterborough. But he was no more prosperous there as a dealer in properties; increasingly burdened by debts and legal claims on his father's estate, he accepted a house offered him, rent free, by the Rev. George Bridges, a somewhat eccentric English friend who greatly admired Catharine and her writings; the house, Wolf Tower, was on the shore of Rice Lake. A year later, in 1847, the Traills rented a nearby property and then purchased Oaklands, a farm overlooking the south shore of Rice Lake a few miles from the lake's southwest end.



Figure 4.2. Canada: Lake Huron to Montreal.

Farming at Oaklands was a little more successful than their first attempt at Lakefield, but their time there came to an abrupt end in 1857 when their house burned down. Thomas Traill became increasingly incapacitated by bouts of chronic depression and died two years later.

Throughout much of this time, despite having given birth between 1833 and 1847 to nine children, seven of whom survived childhood, Catharine augmented the family income by writing sketches from nature, stories and autobiographical articles published in Britain and Canada. London magazines such as *Chambers' Edinburgh Journal*, *Home Circle*, and *Sharpe's London Magazine* brought out some of her Canadian pieces, thanks to contacts through her sister Agnes; she also wrote occasionally for the Montreal magazine the *Literary Garland*, to which her sister Susanna Moodie regularly contributed. A brief period of teaching in Peterborough schools was another of her efforts to earn money, but pregnancies and illnesses restricted her possibilities.

Her first work of lasting botanical value was her 1836 *Backwoods of Canada*, now part of the historical record of the natural history of the Rice Lake Plains. As well as identifying particular species and exact locations, she provided vivid, general pictures of the plant life of the region: "A number of exquisite flowers and shrubs adorn these plains, which rival any garden in beauty during the spring and summer months. Many of these plants are peculiar to the plains, and rarely met with in any other situation." She also touched on one of the factors considered to have influenced the maintenance of prairie vegetation in the region over its long period of Indian occupation: "these plains were formerly famous hunting-grounds for Indians who, to prevent the growth of timbers, burned them year after year; this, in process of time, destroyed the young trees, so as to prevent them again from accumulating to the extent they formerly did. Sufficient only was left to form coverts; for the deer resort hither in great herds for the sake of a peculiar sort of tall grass with which these plains abound, called deer-grass, on which they become exceedingly fat at certain seasons of the year."²⁶

By the 1850s, again thanks to help from her sister Agnes, Catharine had a contract with a London publisher, Arthur Hall, Virtue and Company, for her children's stories set in Canada. *Canadian Crusoes: A Tale of the Rice Lake Plains* appeared in 1852, and *Lady Mary and Her Nurse; or, a Peep into the Canadian Forest* in 1856; the latter was based on sketches published earlier in the Montreal magazine *Maple Leaf*. Her practical advice to emigrant women, *The Female Emigrant's Guide . . .*, first

published in Toronto in parts in 1854 and 1855 and reissued in 1855 as *The Canadian Settler's Guide*, was another fairly successful work.

After Thomas Traill's death, Catharine's brother Samuel helped her to establish herself in a new home, a cottage, Westove, in Lakefield, built in part with her earnings from sales in Britain of small dried-flower and moss collections; some of these she is thought to have saved from the house fire that destroyed most of the herbarium she had built up over the years since her arrival in Canada. From then on, with most of her children grown up, she had the freedom to spend more time on plant studies. Collaborating with her niece Agnes Dunbar Fitzgibbon, a daughter of her sister Susanna Moodie and by then the widow of a Toronto barrister, Charles Fitzgibbon, she brought out *Canadian Wild Flowers* in 1868.²⁷ Agnes, like her mother a skilled flower painter, had taught herself lithography; with some help from her daughters, she prepared the illustrations, a very substantial undertaking involving the hand coloring of every plate, each of which showed a grouping of three or four flowering plants. Agnes also arranged for the publication of the work in Canada. As Catharine explained in her preface,²⁸ the species chosen for inclusion were those she considered to be the most notable and interesting of the wildflowers, shrubs, and forest trees of Canada. Identifications were generally accurate; when she lived in Lakefield, if not before, she had access to Frederick Pursh's *Flora Americae Septentrionalis*,²⁹ and she corresponded extensively with several prominent botanists and naturalists, including George Lawson, John Macoun, and William Hincks. Lawson, then at Dalhousie College, and Hincks, at the University of Toronto, read and approved her manuscript before publication. Sold by subscription, the book went through several editions; as well as being a fine work of art, it remains a valuable historical record, and its appearance in 1868 has been designated one of the markers in the evolution of botanical studies in Canada.³⁰

Catharine Traill's *Studies of Plant Life in Canada*, again illustrated with chromolithographs by her niece Agnes (by then Mrs. Chamberlin) and brought out in 1885 after long delays, was perhaps her most ambitious botanical contribution.³¹ A volume of 288 pages, it contained vivid descriptions of the Rice Lake Plains, with their wide expanses of open prairie rich in the flowering plants and prairie grasses in her time; in addition she presented a relatively detailed botanical account of this flora. Taken together with the information given in *Backwoods of Canada* and *Canadian Wild Flowers*, this adds up to a record of native species of the Rice Lake Plains that, although by no means complete, is substantial. Catharine also noted the striking loss of natural vegetation because of the encroachment of cultivation in the fifty years between her arrival in the early 1830s and when she was writing in the 1880s. Overall she presented her material in a sufficiently pleasant and chatty style to catch the interest of a wide audience.

Although increasingly troubled by illnesses and deafness, she continued to write and look for publishers, helped by Agnes Fitzgibbon's daughter Mary Agnes. Her last substantial publication, *Pearls and Pebbles*, a general work in which she looked back over her entire career as a writer, was brought out when she was ninety-two.³² Throughout her final years she lived quietly in her Lakefield cottage, cared for by her daughter Katharine and granddaughter Katharine Parr Traill; another daughter, Anne, lived nearby. She was never far removed from financial worries, and even when she had become well known as a naturalist, she took in mending to earn money and was glad to accept the gifts of food friends and relatives regularly brought her. She often used salvaged cardboard to press the plants she continued to collect. Latterly she was granted a pension from the Royal Literary Fund in England, and a testimonial, organized by her old friend Sir Sandford Fleming, brought her one thousand pounds in 1898.³³ Recognition also came in Canada from historical societies in Toronto and Peterborough. A variety of the evergreen wood fern *Dryopteris marginalis forma traillae* (G. Lawson) Gruber was named in her honor by George Lawson. Catharine Traill died in Lakefield on 29 August 1899 in her ninety-eighth year.

Despite the loss of most of her herbarium in 1857, a number of small collections of her dried plant specimens are still extant. These include an album of grasses from Stony Lake she sent to her botanist friend James Fletcher in 1894, now in the herbarium of the Plant Research Institute, Ottawa, and a scrapbook of dried plants, *Canadian Ferns, Mosses and Wildflowers*, she mounted and annotated for her grandson Hargrave Muchall in 1891, now in the Fowler Herbarium at Queen's University, Kingston.³⁴ Some of her collections are in the herbarium of the Scottish Natural History Society in the Natural

History Department of the Glasgow Museum. Other botanical scrapbooks and remnants include some in the Rare Book Room of the University of Toronto and others at Trent University and at the Canadian Department of Agriculture, Ottawa. A collection of Agnes Fitzgibbon's flower paintings is held in the Department of Botany at the University of Toronto. In 1964, sixty-five years after Catharine's death, Trent University in Peterborough opened Catharine Parr Traill College, one of its first colleges. Among other things, Traill College serves as the university's base for the Departments of English, Cultural Studies, and Canadian and Native Studies.³⁵

Other women contributors to the plant sciences working in southern Ontario and Quebec before 1900 include Jessie Roy, Lucy Lawson, and Annie Jack; also mentioned here is Eliza Jones, remembered for her contributions to agriculture. Roy was an outstanding field botanist who built up a fine herbarium and exchanged specimens with botanists throughout North America and Europe; her particular interests were mosses, ferns, and flowering plants. Lawson, the wife of Queen's College, Kingston, natural history and chemistry professor George Lawson, published two papers in the 1860s on silkworms and the plants that sustain them; Jack was a Quebec horticulturalist and a prolific writer on gardening topics, and Jones was a stockbreeder and dairywoman.

JESSIE DALRYMPLE ROY,³⁶ née GREGG (1813–1889), a native of Ireland of Scottish descent, grew up in Aberdeen and had a good education, which included some instruction in science, particularly botany. The date of her arrival in Canada is uncertain. She and her Scottish husband, William Roy (1808–1895), lived for a time in Montreal, where Roy and his brother were very successful in the dry-goods business. Later they moved west to the region of Brantford, some twenty-five miles north of the Lake Erie shore, and in 1863 bought Royston Park, an extensive property just north of the community of Owen Sound on Georgian Bay, Ontario (figure 4.2). William Roy became very prominent in the Owen Sound business community, particularly the financial establishments. A successful fruit grower, producing a variety of high-quality fruits at his orchards at Royston Park, he was a well-known member of the Fruit Growers' Association of Ontario. On occasion he and Jessie hosted the association's members in their gardens at Royston Park, which were noted for "many varieties of flowering shrubs and rare plants, flourishing luxuriantly."³⁷

Jessie Roy is thought to have become active in botanical work only after she moved to Owen Sound. Situated at the base of Bruce Peninsula, an area already well known to botanists for rare plant species, Owen Sound was an ideal location; much of the peninsula now comes under the UNESCO World Biosphere Reserve classification. Her interest in the preparation and exchange of herbarium specimens probably arose through her friendship with Coe Finch Austin (1831–1880), whom she met while visiting her brother, William Gregg, superintendent of a large market in Lodi, New Jersey. Austin, one of the leading American bryologists of the time, was already engaged in correspondence and exchange with bryologists and other botanists throughout North America and Europe; he had received a number of specimens from Mrs. Roy, and he well knew that others would welcome a direct botanical contact at Owen Sound.

By the mid-1860s she had done a considerable amount of botanizing around Owen Sound, specializing in ferns and mosses. She discovered a number of rare ferns, including *Dryopteris filix-mas* (L.) Schott, the male fern, the first record of this species in Canada; other rare fern species she found were *Polystichum lonchitis* (L.) Roth, *Asplenium viride* Hudson, and *Cryptogramma stelleri* (Gmel.) Prantl. In the summer of 1871 the Roys invited noted botanist John Macoun to visit them at Royston Park. Much of the collecting Jessie Roy did with him was in the immediate vicinity, but they also explored north of the town and some distance up the Bruce Peninsula. At Red Bay on the Lake Huron side of the peninsula Macoun had his first sight of panne-dune complexes, the small interdunal wetlands, sensitive ecosystems known for their great variety of plant species. Their collections included many mosses and ferns, as well as flowering plants. A set of the mosses was sent to Thomas Potts James of Harvard, then working with Leo Lesquereux on their *Manual of the Mosses of North America* (1884); Sereno Watson, also at Harvard, was given a set of vascular specimens. Drawn by the floral wealth of the Bruce Peninsula, Macoun paid a second visit to Owen Sound in 1874.

Jessie continued her collecting throughout the 1870s and early 1880s, although a hip dislocation caused by being thrown from a sleigh in 1876 somewhat restricted her activities. In 1873, during one of several transatlantic trips, she obtained specimens from Scotland and Switzerland. Five years later she

visited Niagara Falls, and she also went north as far as Manitoulin Island; but most of her botanizing was done in the Owen Sound area. In 1880, after two years of poor health, she spent a summer at Peaks Island, a resort off the coast of Portland, Maine; while there she was still fit enough to collect marine algae for her herbarium, which had been a steady interest for much of her life. She died in 1889, her last days having been spent in a sanitarium in Rochester, New York. Her large herbarium, thought to have been of considerable value in her time, was left to her son Alexander Keeler Roy, a Toronto stationer; she had two other children, a daughter, Jessie, who died when the family was still in Montreal, and a son Willie, who also predeceased her.

Jessie Roy was known as a particularly careful collector who took great pains to send the best possible specimens to her correspondents and exchange partners. Several of the ferns she sent to Daniel Cady Eaton at Yale were cited in his *Ferns of North America*, some serving as models for the illustrations prepared by J. H. Emerton and C. E. Faxon.³⁸ One of her specimens, now in the fern collections of the Irish National Botanic Gardens, Glasnevin, Dublin, is thought to have been shown in the fern exhibition at the Colonial and Indian Exhibition in London in 1886.³⁹

In addition to winning this international recognition, her contributions to North American bryology were important, since she was the first to explore extensively in the Owen Sound area and the Bruce Peninsula, territory rich in bryoflora. Particularly notable were two mosses found by her and Macoun in 1871, *Hylocomium brevirostre* (Brid.) B.S.G., the only specimen recorded in Ontario, and *H. pyrenaicum* (Spruce) Lindb., for which there are only a few Ontario records and probably none earlier. In 1876 she discovered the arboreal species *Calliergon richardsonii* (Mitt.) Kindb ex Warnst. at Owen Sound, the most southerly station known for this species.

As well as the botanists already mentioned, those with whom she exchanged specimens included James Fowler at Queen's College, Kingston (where the Fowler Herbarium still houses some of her specimens), David Watt in Montreal, George Lawson at Dalhousie University, and Catharine Parr Traill in Lakefield. As a result of being listed in Cassino's 1880 *Naturalists' Directory*⁴⁰ and in the Torrey Botanical Club's "Botanical Directory," she was contacted by many collectors in the United States, among them Henry Nicholas Bolander and Townshend Stith Brandegee in California and George Edward Davenport in Boston. In Scotland and continental Europe she exchanged specimens with Victor Brotherus in Finland, John Fergusson and William Wilson in Scotland, and Paul Heinrich Reinsch in Bavaria, as well as others.⁴¹ Specimens collected by her that are held in important European collections include ferns and flowering plants (Leiden), ferns (Liege), and bryophytes (Oxford).⁴²

A dedicated field botanist eager to take part in the botanical information flow by exchanging specimens with fellow collectors and herbarium builders, Jessie Roy has an honorable place among those who established and communicated the basic facts (actual examples of species), from which generalizations could be made and theories formed.

Little information is readily available about the early life of LUCY LAWSON,⁴³ née STAPLEY (d. 1871), other than that she was the daughter of Charles Stapley of Tunbridge Wells, Kent. Her marriage to botanist and future professor George Lawson took place in Edinburgh, possibly about 1850. George Lawson, who had grown up in Dundee, studied natural history and physical sciences at the University of Edinburgh for several years beginning in 1848, while at the same time participating in the work of several local scientific organizations. In 1858 he was appointed professor of natural history and chemistry at Queen's College, Kingston, Ontario.

Judging by her writings, Lucy Lawson had a good education, as well as a lively interest in the plant sciences; in Kingston she was recognized as an accomplished botanist. In 1860 she joined the Botanical Society of Canada, a group founded that year by George Lawson and several of his Queen's College colleagues; her presence in the short-lived but very active group, which from the start accepted women, encouraged other women to take part as well.⁴⁴

Her earliest published work appeared in the first issue of the society's *Annals* (see bibliography). This paper, which she presented at the society's third meeting and directed especially toward women, discussed a practical application of botany to agriculture. The general area of applications was one of special interest to George Lawson over the years and was also an important concern of the new society: Lucy's particular topic in 1861 was the food plants of the silkworm and other fiber-yielding insects. Noting that the production of fibers suitable for spinning from insect sources had been a subject of

continuing interest in Europe for many years and that the demand for silk cloth was still increasing, she pointed out that parts of Canada had climate and soils favorable to the growth of trees that support silkworms. Furthermore, the work of rearing worms and harvesting cocoons could readily be done by women and children and so provide a possible source of independent income for farm women. She focused especially on the caterpillar of the ailanthus moth, *Bombyx cynthia*, which feeds on *Ailanthus altissima* (P. Mill) Swingle, a native of China and Malaysia. Sometimes referred to as “the tree of heaven,” *A. altissima* is a hardy species cultivated throughout Europe and North America. At that time, *Bombyx cynthia* was attracting much attention in Europe. The silk made from its cocoon, while coarser than that made from the fiber produced by the mulberry silkworm, *Bombyx mori*, was seen as a possible substitute for Europe’s large imports of American cotton.

As well as suggesting the possibility of producing “Ailante silk” in Canada, she also noted that the native cecropia moth, *Hyalophora cecropia* of the Saturniidae family, was another possible source of fiber. The largest of the North American moths, cecropia can be fed on the leaves of several of Canada’s native fruit trees. This moth was the principal subject of her 1864 paper published in the Berlin journal *Zeitschrift für Akklimatisation*, the natural products of Canada then being of considerable interest to European scientists. Silk production was the subject of other papers read before the Botanical Society before its demise in 1863, and the possibility of using silk from native silk moths was also being considered about then by leading members of the newly founded Entomological Society of Canada.⁴⁵ The subject was very much “in the air” at the time.⁴⁶ Neither of the moths discussed by Lucy Lawson became important as the basis of silk manufacture in Canada, despite encouragement from Italy in the form of a supply of living cocoons of the new Chinese silk moth *Saturnia cynthia*, sent to the society in 1863 for distribution to interested members.⁴⁷

In 1863, because of increasingly strained relations between George Lawson and the trustees of Queen’s College, the Lawson family, which included two daughters, moved to Nova Scotia, George Lawson having been appointed professor of chemistry and mineralogy at newly reorganized Dalhousie College in Halifax. Lucy Lawson died in 1871. The model farm, Lucyfield, which Lawson developed at Sackville near Halifax, was named after her.

By the last quarter of the nineteenth century two women, Annie Linda Jack in Quebec and Eliza Maria Jones in Ontario, were making noteworthy contributions to Canadian farming practice, Jack in horticulture and Jones in dairying.

ANNIE LINDA JACK,⁴⁸ née HAYR (1839–1912), probably Canada’s first notable woman garden writer, was born on 1 January 1839 in Northamptonshire, the daughter of John Hayr; her mother is thought to have died when Annie was quite young. In 1852, when she was thirteen, her father and she emigrated to the United States. Without delay she was enrolled in the Troy Female Seminary, the earliest academically progressive high school for girls in the country, established by Emma Hart Willard in Troy, New York State, in 1821. As well as teaching subjects such as science and mathematics, material then widely considered unnecessary for girls, this school provided teacher training. At age sixteen, while still completing her studies, Annie became first assistant in the free schools in Troy. She is also reported to have had her first writing success then, a number of her school essays being published in a Boston newspaper.⁴⁹ A few years later she moved to Canada, taking a position as schoolteacher in Chateauguay, Quebec, a region on the south side of the St. Lawrence River not far from Montreal. In 1860, at the age of twenty-one, she married Robert Jack, the son of John Jack, a blacksmith from Greenock, Scotland, who had brought his family to Canada in 1833 when Robert was a boy of twelve; by the time of his marriage Robert was running the family farm, Hillside, a fairly prosperous 240-acre property producing a variety of crops and dairy products in Chateauguay County. Soon after she settled on the farm, Annie asked for an acre of land where she could plant what she chose, her hope being to provide herself with some independent income. It was to some extent due to her encouragement and enthusiasm that over the next few years a variety of fruit trees, berry bushes, and vines were planted at Hillside farm and a greenhouse built onto the farmhouse. Annie also experimented with ornamental trees and flowers, including some rare varieties. Starting in 1861 the first of her eleven surviving children was born, the others following in fairly quick succession. By 1871 she had begun to publish gardening articles and commentaries on such topics as children’s education and career opportunities for women. These appeared in various Canadian and

American newspapers and magazines, including the *Canadian Gleaner*, the *Rural New Yorker*, and *Harper's Young People* (New York).

Conscious of the value of practical, up-to-date information as the basis of successful farming, the Jacks joined the Montreal branch of the Entomological Society of Ontario in 1874. Having secured steady financial support from the Council of the Agricultural and Arts Association of Ontario, the society was by then strongly committed to applied entomology, the work of its leading members being keyed to the needs of growers. It had already published a sixty-page *Report* on insects affecting apples, pears, grapes, and plums, providing the kind of specialized information needed by producers like the Jacks.⁵⁰ The Montreal branch of the society held its first meeting in August 1872, and by May 1873 it had twelve members;⁵¹ Hillside farm hosted the group's annual field day in 1875.⁵²

By 1877 Annie and Robert Jack were also active members of the Montreal Horticultural Society and Fruit Growers Association of the Province of Quebec. They and their children often won prizes at the society's annual shows. Annie contributed many articles to the society's *Reports*, all of them strongly focused and supplying eminently practical advice on the growing, packing, and marketing of fruits and flowers. These included, for example, an account of the Jacks' experience in what was in the 1870s the fairly complex undertaking of shipping barrels of the choice Quebec Fameuse variety of apples from Montreal to Liverpool and successful marketing in England. Rural beautification was another of Annie's topics (see bibliography).

Although Robert Jack's income declined during the late 1860s and early 1870s while he was changing over from the traditional farm production of grains, root crops, and dairy products to what was a niche market in fruits and vegetables, by 1875 he was realizing bigger profits than he had ever had previously. By the 1880s he was well known as one of the province's most important horticulturalists and seed producers, and by the 1890s he was also selling a variety of fruit trees, shrubs, and plants, as well as seed corn. This success was the result of a considerable amount of experimentation with cultivation techniques and plant varieties, careful record keeping, and a dependable supply of light hand labor, the latter provided in large part by the Jack children.

As well as sharing fully in the work and development of the orchard and building up a fine garden, where she carried out a considerable amount of innovative experimentation, Annie was much involved in the education of her eleven children. Initially they attended local schools, but later, dissatisfied with the old rote learning methods used there, she taught them at home, occupying the long winter evenings with lessons and presentations on a variety of subjects. A number of independent informal learning activities allowed her to keep abreast of scientific advancements and educational trends; she read widely, attended lectures in Montreal whenever possible, corresponded with geologist John William Dawson, principal of McGill University, who supplied her with books and lecture tickets, and was a corresponding member of a science club in Boston, a city where she often visited friends.

By the 1890s Annie Jack's reputation as a writer was well established; the Montreal Women's Club made her an honorary member in 1895. As well as her articles on rural life and horticulture, she published inspirational short stories, poems, and articles of general social interest. Active in the Woman's Christian Temperance Union of the Province of Quebec, she frequently contributed temperance articles to various newspapers. Her "Amateur Department" in the Toronto publication *Canadian Horticultural Magazine* answered readers' questions and provided advice on gardening during the seasons; some of the more-specialized articles appeared in another Ontario Fruit Growers' Association journal, the *Canadian Horticulturalist*, between about 1901 and 1911. Her most important work was her popular horticultural handbook *The Canadian Garden: A Pocket-Help for the Amateur*. First published in 1903, with a second edition in 1910, it is widely considered a landmark in the history of gardening in Canada. Her own experimental garden in Chateauguay was much admired by American botanist and horticulturalist Liberty Hyde Bailey, and he included an entry on her in the horticulture cyclopedia that he edited.⁵³

Other publications by Annie Jack included a collection of short stories, *The Little Organist of St. Jerome*, set in the French Canadian villages and British settlers' farms of rural Quebec; a short booklet of poems, *Rhyme-thoughts for a Canadian Year*; and another booklet of essays and poems, *Maple Lore*, which celebrated Canada's maple trees.⁵⁴ Her writing continued for as long as she lived; her last article was sent to the *Montreal Witness* a few days before her death in Chateauguay on 15 February 1912, a month after her seventy-third birthday. She had outlived her husband by twelve years.

Annie Jack's eldest son, John George Jack, despite the fact that his formal education did not extend beyond high school level, became a noted dendrologist, from 1908 assistant professor of dendrology at the Arnold Arboretum at Harvard University, where he conducted well-attended field classes geared to the interested amateur. One of John Jack's earliest scientific interests had been entomology, undoubtedly encouraged during his boyhood by his family's close association with the Entomological Society of Ontario; among his first publications was his note in the society's annual *Report* of his capture in the Jack orchard of the rare butterfly *Papilio cresphontes* Cram. (the "giant swallowtail"), which he thought was a first record for Quebec. The genus *Sinojackia* Hu, from China, and ten species or hybrids of trees and shrubs are named after him.⁵⁵

ELIZA MARIA JONES,⁵⁶ née HARVEY (1838–1903), dairywoman, stockbreeder, and author, was born on 24 December 1838 in Maitland, Ontario, a small town on the north bank of the St. Lawrence River, about 125 miles upstream from Montreal. She was the second eldest daughter of farmer and prominent miller Robert Harvey and his wife, Sarah, née Glassford. Eliza attended schools in Montreal and Scotland, but after the early death of her mother she stayed on the family farm to take care of five younger siblings; that period may well have been formative in the development of her interests in dairying and stockbreeding.

In 1859, when she was twenty-one, Eliza married architect and engineer Chilion Jones, son of politician, judge, stockbreeder, and businessman Jonas Jones of the nearby town of Brockville (figure 4.2). The strongly empire loyalist Jones family arrived in the region from the Boston area just after the American Revolution; they were among the founders of Brockville and for long very prominent and influential in the government of Upper Canada (Ontario). Eliza's husband, Chilion Jones, was a member of the firm of Fuller and Jones that designed the new Parliament buildings in Ottawa; when in 1860 the Prince of Wales laid the cornerstone of the new Parliament, Eliza, an excellent horsewoman, rode a handsome gray in the welcoming procession. She also had her own favorite mount at this time, a black horse named Hawke, given to her by Chilion as an engagement present.

After the completion of Chilion Jones's work in Ottawa, he and Eliza returned to their home in Brockville, a small property of a few acres on the outskirts of the town. During the 1860s, as well as giving birth to four children, Eliza Jones started a small dairy farm on two small nearby landholdings she rented. Initially she kept the crossbred stock generally favored in Ontario, dual-purpose animals that supplied both milk and beef. The small amount of butter she produced from their milk she sold locally. In 1873 she bought a Jersey-cross cow and subsequently acquired and started to breed pureblooded Jersey cattle. Although Jerseys were then considered small and wasteful in Ontario, Eliza was much impressed by the quality of the butter she could make from their milk.

At that time most butter was produced in small amounts and sold to local storekeepers, who either sold it to their customers or packed it for shipping to other locations. Often produced under difficult and unsanitary conditions and packed in dirty containers, it not infrequently was discolored, rancid, and at worst fit only for use as axle grease by the time it reached its destination. Over the course of a few years following her switch to Jersey cattle, Eliza Jones taught herself to make rich, high-quality butter under the cleanest conditions. She sold it at a premium price to important customers in Canada and the United States, particularly New York, and by the 1890s was shipping over seven thousand pounds a year. Her customers included the Rideau Club, Ottawa's famous social club, and the Canadian Pacific Railway, which used her butter in its dining cars.

She had started her dairy herd from purebred stock bought from a family friend, Romeo H. Stephens of Montreal. In the late 1860s Stephens, along with his father, a wealthy Montreal retail merchant, and his brother Harrison, had established at Saint-Lambert, on the southern outskirts of the city, the first major Jersey herd in Canada, bred from animals from the Queen's farm at Windsor and others that came directly from Jersey; by the later decades of the nineteenth century the Saint-Lambert strain had become famous throughout North America for its cream production. From this top-quality stock Eliza Jones built up a large herd. Her animals were well cared for, fed a carefully balanced ration, and housed in a clean, gas-lit barn; some of her dairy equipment was powered by a steam engine. She employed three men but herself kept a close watch over all the farm's operations, from the butter making to the accounts and bookkeeping. Her husband had little to do with the farm, being absent much of the time managing his brother's shovel factory in Gananoque, about thirty miles upstream from Brockville.

By the 1880s she was showing cattle and winning major prizes at important fairs and exhibitions in Ontario, Quebec, and New York State. A member of the Canadian Jersey Cattle Breeders' Association and a frequent contributor to agricultural periodicals such as the biweekly *Farmer's Advocate and Home Magazine*, she sold stock to individuals and institutions throughout North America, including the Ontario Agricultural College in Guelph, which maintained an important demonstration herd. The series of articles on dairying that she contributed to the Montreal newspaper *Family Herald and Weekly Star* led to her receiving so many letters of appreciation and requests for further information from all across the United States and Canada that she expanded the series and published it in book form. *Dairying for Profit* appeared in 1892 and was an outstanding success. Dedicating it to the farmers' wives of America,⁵⁷ Eliza made sure it sold at a price low enough to put it within the reach of even the poorer farm families. Over fifty thousand copies were bought by the Ontario Department of Agriculture alone; the *Farmer's Advocate* gave away copies as a subscription bonus and praised the work enthusiastically, advertising it as "the best book ever written."⁵⁸ Translated into several foreign languages, it was considered to have done much to revolutionize the care and feeding of dairy cows and the handling of dairy products.⁵⁹

Eliza stressed three principles—quality, cleanliness, and bookkeeping—and offered guidance on how to carry out work that would meet high standards and produce good results. By 1893, the year of the Chicago Columbian Exposition, she was so widely known as a dairywoman that she was selected as one of the exposition's judges of butter. That year also she published an eight-page pamphlet on cooperative dairying and winter dairying.⁶⁰ Four years later, the Toronto periodical *Farming* named her the best-known dairywoman on the continent.

In 1896, following the sale of most of the farmland she had rented for almost thirty years, she sold half her herd to Benjamin Hartz, a successful businessman and farmer who maintained a showcase dairy and stock operation on the outskirts of Charlottetown, Prince Edward Island.⁶¹ Eliza was then about fifty-eight. Keeping only a few cattle to meet the needs of her family, she went on to develop her early interests in horses, breeding and selling both carriage horses and racehorses. About this time she was also publishing short stories and other light, popular pieces in the *Farmer's Advocate*, to which she had earlier contributed many of her articles on dairying. In the autumn of 1902 she moved to Gananoque to be with her ailing husband; she died there on 6 April 1903 in her sixty-fifth year.

After Eliza Jones's death, the remainder of her Jersey herd was sold (at prices she had already set), but her interest in horses has passed on through several generations of her descendants. Her daughter Elsie, later Elsie Bedford-Jones, was a noted horsewoman, one of the first women to compete at Madison Square Garden, New York City; she was also commissioned to find horses to serve overseas in the First World War. Both Elsie and her daughter Gwynneth Bedford-Jones were active members of the Montreal Hunt, the oldest continuous hunt in North America, founded in 1825 by British army officers. Elsie inherited from her brother Frank Jones the eighty-acre Franklands Farm just east of Brockville, a stretch of land along the St. Lawrence that provided ample space for the breeding and showing of outstanding horses. The farm is now owned by the sixth generation of Jones descendants, who actively and enthusiastically support the pursuit of excellence in equestrian sport in Canada at the highest levels. Eliza Jones, the founder of this family tradition that is now more than a century old, has a fine memorial.⁶²

The founding of the Ottawa Field-Naturalists' Club in 1879 encouraged a shift in Canadian bird studies from the earlier procedure of building collections of dead specimens taken by hunting to one of observation of living birds. This shift not only saved additional species from going the way of the passenger pigeon, but had the side effect of bringing more women into mainstream bird study.

The remarkably early and somewhat exceptional observational work of Harriet Sheppard in the 1820s and 1830s around her place of residence near Quebec has already been noted. By the 1880s the countryside around Ottawa was becoming a region of considerable ornithological activity. Observers were drawn by the bird life of the Ottawa River Valley (figure 4.2), a major bird migration route to and from the Arctic breeding grounds, as well as a seasonal visiting place; then as now the valley's bird life was rich and varied. The founding of the Ottawa Field-Naturalists' Club, even though most of its members were concerned predominantly with geology and plant study, provided a meeting place in its ornithological branch for amateur ornithologists and the possibility of developing organization and

leadership in this area; the club's journal, the *Ottawa Naturalist* (issued under the title *Transactions of the Ottawa Field-Naturalists' Club* between 1880 and 1887), offered an opportunity for the publication of papers and notes. Nevertheless, as was noted in the club's annual report for 1897–1898, the level of interest in bird study among Ottawa residents in general was disappointingly low during the last decades of the nineteenth century. Enthusiasts of these years would undoubtedly have been well pleased that fifty years later, by the 1940s, Ottawa had become the major location for ornithological research in Canada.

The first woman to become a club member was probably GERTRUDE HARMER⁶³ of Hintonburgh, Ontario (part of the city of Ottawa from 1907), who joined in 1890. Her initial list of sixty-five species led to her being a birding leader for several years in the 1890s. Along with two other leaders, A. G. Kingston and W. T. Macoun, she prepared the report of the ornithological branch of the club for a number of years, beginning in 1897. Her note on the eastern bluebird, *Sialia sialis*, a summer resident in the Ottawa Valley, appeared in the *Ottawa Naturalist* in 1897 (see bibliography). Here, as in the general ornithological branch report for 1897, she noted the scarcity of the species, attributing this to the severe frosts in its wintering grounds in the southern United States in the 1895–1896 season.

The Harmer family moved frequently from the late 1880s until about 1909, first to Ontario communities west of Ottawa and then to Entwistle, Alberta, about sixty miles west of Edmonton. Now an oil and gas industry center, Entwistle in 1909 was a boom town because of the construction of the Alberta section of the Grand Trunk Pacific Railway then going on. Gertrude Harmer appears to have dropped her membership of the Ottawa Field-Naturalists' Club after 1915.

A. C. TYNDALL of Cummings Bridge, now part of Ottawa, published five reports and papers in the *Ottawa Naturalist* between 1896 and 1899 (see bibliography). These were chatty notes recording the species she had observed in her garden and in the surrounding woodlands, including the Rideau River area (figure 4.2) south of Ottawa where she lived, an especially fine place for bird watching. Miss Tyndall had a not unappealing but somewhat anthropomorphic view of her birds, the summer visitors as well as the unfortunate injured specimens left behind when their fellows had gone south for the autumn.

The Maritimes: An Early Botanical Artist and Four Collectors

Halifax, Nova Scotia, the home and place of work of flower painter and botanical artist Maria Morris, was a prosperous and vibrant community throughout much of the first half of the nineteenth century. The largest and wealthiest town in the region, seat of government, major port, and a British army and navy base, it was also the cultural and artistic center of the Maritime provinces of British North America. By the 1820s, despite a period of reduced prosperity for a few years after the end of the War of 1812, there was a sufficiently large number of affluent, merchant-class families and members of the colonial elite to provide the financial patronage to attract and hold professional artists. As part of an influx of immigrants, especially from Britain, a considerable number of itinerant artists came to Nova Scotia, some to settle. Such was the environment in which Maria Morris grew up.

MARIA FRANCES ANN MORRIS,⁶⁴ later MILLER (1813–1875), the daughter of Captain Guy Morris and his wife, Sibylla Amelia Maria Sophia, née Leggett, was born in Halifax on 12 February 1813. Little is known of her childhood, but the Morrises were a successful merchant family, prominent in Halifax society and well known in the town's literary and artistic community. Despite the death of Guy Morris when Maria was very young, her education was not neglected. As a teenage girl she attended the art classes, then very popular with middle- and upper-class Halifax women, that were given by William Harris Jones, art instructor at Dalhousie College from 1828.⁶⁵ Maria was one of his best pupils, and his influence on her later career was considerable.

Before moving to Halifax, Jones, who was probably American by birth, had been an art teacher and educator in Boston and Baltimore and while there had gained experience in planning and organizing successful art exhibitions.⁶⁶ The two exhibitions he organized in Halifax with the support of wealthy patrons in 1830 and 1831 included works by his pupils, Maria Morris among them, and the enthusiastic reception with which these events were greeted provided further encouragement for the community's artists.

By about 1830 Maria was teaching in a small school conducted by her mother in Halifax, and shortly after that she was running her own drawing and painting classes for young ladies in the family home. In 1833 she held an exhibition of her own and her pupils' works. She still continued her training as well, by then with art teacher Professor L'Estrange, an Englishman, William Jones having returned to the United States in 1831. Within a few years she had gained a reputation as one of Halifax's outstanding art teachers.

Encouraged by land surveyor and naturalist Titus Smith (1768–1850), a native of New England who had come to Halifax with his father in 1783, she began to paint native wildflowers; Smith, who by the 1830s was very knowledgeable about the trees and flowering plants of Nova Scotia, collected live specimens for her. In all she produced 146 watercolors of the wildflowers of the province, published as a series of hand-colored lithographs prepared in London. The first part, *Wildflowers of Nova Scotia*, a set of six lithographs with descriptive text by Titus Smith, appeared in 1840 under the patronage of Sir Colin Campbell, lieutenant governor of Nova Scotia. Further sets were issued in 1853 and 1866; the first of these, under the patronage of Sir John Gaspard Le Marchant, had notes by Alexander Forrester, Presbyterian minister, naturalist, and agriculturalist, and the other, entitled *Wild Flowers of British North America*, under the patronage of Sir William Fenwick Williams, included text by George Lawson, then professor at Dalhousie College. A fourth part of the series, again under the patronage of William Williams (then the provincial lieutenant governor), with text provided by George Lawson, was published in London in 1867.⁶⁷ That year also a collection of the paintings was shown at a universal exposition in Paris. Although not a commercial success, as was very often the case with art albums of the time, Maria Morris's *Wildflowers of Nova Scotia* was much admired by the local community, and her pictures won praise from the London press as well. A competent botanical artist, producing clear, delicate, and accurate illustrations, she is generally acknowledged to have been the most talented among a group of nineteenth-century Maritime women flower painters—the “Audubon of Nova Scotia.”⁶⁸ Her published work, with the descriptive texts contributed by prominent botanists, constitutes a valuable addition to the nineteenth-century botanical record of the region.

Following her marriage in 1840 to a prosperous Halifax and LaHave property owner and businessman, Garrett Miller, she gave up teaching for a time. However, the marriage is thought to have been less than satisfactory;⁶⁹ by the early 1850s, although by then she had five children, she was again offering drawing classes. These she continued for most of her life, but there is no indication that she undertook further work in botanical illustration. She died in Halifax on 28 October 1875 at the age of sixty-two.

After the enthusiastic Lady Dalhousie (see above), who collected plants in Nova Scotia in the period 1816–1820, only a few women nineteenth-century collectors in the Maritimes have yet been identified. Among them was Anne Haviland, a member of a wealthy English immigrant family who collected about three decades later than Lady Dalhousie.

ANNE ELIZABETH HEATH GRUBBE,⁷⁰ later HAVILAND (1818–1902), one of the thirteen children of John Grubbe, gentleman, of Horsenden House, Buckinghamshire, and his wife, Sarah Anne, née Carrington, of Ide, Devon, was born on 28 September 1818. Horsenden House, an old manor-house in the Vale of Aylesbury where she and her siblings were born and grew up, had been owned by the Grubbe family since the mid-seventeenth century, although its origins dated back to pre-Norman times. Little is known about Anne's early years, but given her family's position and wealth, her education was probably not neglected; the rich Vale of Aylesbury countryside where she spent her girlhood may well have stimulated an interest in natural history.

In 1841, when Anne was twenty-three, John Grubbe sold his ancestral home to the Duke of Buckingham and Chandos and, accompanied by Anne and several of his other children, as well as “a Lady,” a housekeeper, and eight servants, sailed on the vessel *John Craig* from London to Prince Edward Island. There he bought two properties, Holland House in Charlottetown and the country house Falconwood, then some distance outside Charlottetown. The remaining members of the family appear to have stayed in England.⁷¹

John Grubbe had very little time in his new home; he died in Charlottetown in 1846. In January of the following year, Anne married lawyer and politician Thomas Heath Haviland (1823–1895), descendant of a Gloucestershire family, who later became lieutenant governor of Nova Scotia. Her first child, Edith Alice Constance, was born in 1847, and eight more followed in the years to 1860:

five girls, only two of whom lived to adulthood, and three boys. Over much of the same period she collected native plants of the island; the thirty-two specimens she assembled between 1849 and 1854 were considered, at least up to 1948, to be the oldest botanical specimens from Prince Edward Island still extant. This collection was taken to England either by her or by a relative such as her niece Julia Grubbe, a plant collector who worked near Southwold on the Suffolk coast. Rediscovered in the old family house in Southwold about 1946, the collection was presented to the Kew Gardens herbarium by Margaret Grubbe of Blythburgh, Suffolk. The species are those that might be expected, such as the shrub *Rhodora canadensis* (*Rhododendron canadense*), typical of boggy regions in northeastern North America; the shrub *Kalmia angustifolia*, the sheep laurel; *Cornus canadensis*, the dogwood tree; and *Epigaea repens*, the evergreen heath known as trailing arbutus or mayflower, typical of eastern Canada and the northeastern United States.

Whether or not Anne Haviland carried out further plant collecting over the next two or three decades is not known; duties related to Thomas Haviland's activity in provincial politics may have encroached on her time. She died in Charlottetown on 10 November 1902, six weeks after her eighty-fourth birthday, having outlived her husband by seven years. Burial was in St. Peter's Cemetery, Charlottetown.

Little information is readily accessible about the remaining three nineteenth-century women mentioned here who contributed to the exploration of the region's natural history—Louise Jagggar, Lucy Eaton, and Caroline Heustis. All were active some years later than Mary Morris and Anne Haviland.

A. LOUISE JAGGAR⁷² (fl. 1890s–1903) carried out botanical studies and reported her findings to the Nova Scotian Institute of Science, by then a well-established organization, which had brought out the first issue of its journal in 1863. Her 1903 report, recorded by title only in the institute's *Proceedings*, concerned the flora of Digby County at the southern end of the Nova Scotia peninsula. The list of phanerogams she presented was recommended for inclusion in a general provincial flora. When she joined the institute as an associate member in 1900, Miss Jagggar was living in Smith Cove, Digby County; in subsequent years her address changed, first to Cambridge, Massachusetts, and in 1903 to Redlands, California.

Butterfly enthusiast LUCY C. EATON (fl. 1890s) worked in the Truro region. Her list of twenty-six species, with notes on abundance, was read for her at a meeting in Halifax of the Nova Scotian Institute on 15 April 1894 (see bibliography). Institute member Piers, who read Miss Eaton's paper, added his own comments, pointing out the need for reliable, annotated, local lists from particular parts of the province, all previous catalogs having been from the Halifax area. Additional remarks compared Eaton's findings with reports by other workers, including Piers himself.

CAROLINE E. HEUSTIS (fl. 1870s–1880s), a resident of St. John on New Brunswick's Bay of Fundy shore until about 1882, when she moved to Parrsboro, Nova Scotia (figure 4.3), collected plants, minerals, and insects in Nova Scotia and New Brunswick in the 1870s and 1880s. In 1879 and 1880 she sent short communications to the *Canadian Entomologist* reporting the scarcity of butterflies and moths, as well as other insects, that had been numerous in both provinces in previous years. Her painstaking observations on larvae of the butterfly *Pyrameis cardui* infested by the parasitic insect *Ichneumon rufiventris* were published in 1881; a second paper reported on the specimens of the butterfly *Limenitis arthemis* she found over the course of a several-day, forty-five-mile collecting trip along the southern shore of Cumberland County, Nova Scotia, in August of 1882 (see bibliography). She wished particularly to point out that her observations confirmed the theory recently suggested by William Henry Edwards that the species is double-brooded.⁷³ Although Lucy Eaton about a decade later reported that this species was not common around Truro, Mrs. Heustis noted that it appeared to be quite abundant in Cumberland County, especially in damp woodland areas. She was clearly a keen and knowledgeable naturalist.

Rocky Mountains: Botanical Collectors, Artists, and Writers

By the late 1880s the wilderness areas and the little-explored heights of the Canadian Rockies were attracting a number of enterprising North American women explorers and naturalists eager to experience the exhilaration of venturing into the unknown, the excitement of discovery, and the peace and beauty of that "vast, glorious, unexplored country." Among them were botanist, writer, and alpinist Julia

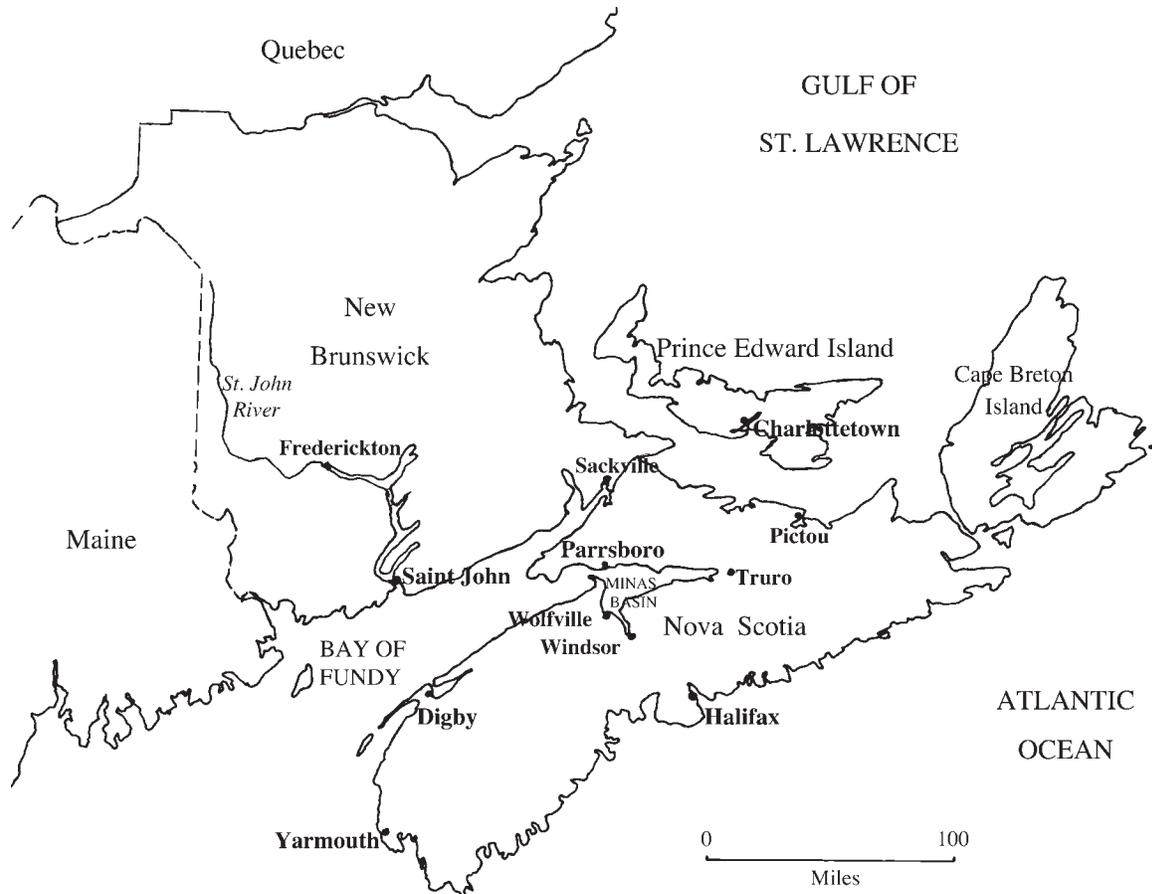


Figure 4.3. Maritime provinces: Nova Scotia, New Brunswick, and Prince Edward Island.

Henshaw, botanical artist, explorer, and writer Mary Schäffer Warren, botanical artist and naturalist Mary Vaux, and plant collector Edith Farr.⁷⁴

JULIA WILLMOTTE HENSHAW,⁷⁵ née HENDERSON (1869–1937), the daughter of William Henderson of Durham and Ashton Court, Shropshire, was born in Shropshire in 1869. An amateur naturalist, Henderson was a man of considerable means. Julia was taught by governesses and tutors and concentrated on modern languages and art, receiving much of her instruction in France and Germany; her father encouraged her love of the outdoors and her interest in flowers. In 1887, at the age of eighteen, she married Charles Grant Henshaw of Montreal, a well-connected investment broker of United Empire Loyalist (American loyalist) descent;⁷⁶ her only child, Doris, was born in 1889.

In 1890 the Henshaws moved to Vancouver, then little more than a small town but growing rapidly. At that time it was being rebuilt as a modern city with up-to-date water, electricity, and streetcar systems following a disastrous fire in 1886. Within a few years of the Henshaws' arrival, the population had reached fifteen thousand; by 1900 Vancouver, an important lumber industry center and, from 1887, the western terminus of the Canadian Pacific Railway, had a hundred thousand residents.

In the 1890s Julia Henshaw began publishing short articles in a variety of periodicals, such as the *Girls' Own Paper*, *Ladies Pictorial*, and the *Traveller*. Later referred to as Vancouver's "pioneer newspaper woman," she was the first literary and theater critic for the city's first daily newspaper, *The Province*, which started in 1898; for several years she also worked on the editorial staff.⁷⁷ Later she became a columnist for the *Vancouver Sun*, the rival daily that began publishing in 1912; she edited the *Sun*'s "Book page" and wrote its "Note book" column for many years. Two of her articles describing

the new city of Vancouver appeared in the Toronto monthly the *Canadian Magazine* in 1898 and 1899, both under her pen name of Julian Durham.⁷⁸ Her two lengthier works, the romance *Hypnotized? or, The Experiment of Sir Hugh Galbraith*, and a comedy-thriller, *Why not Sweetheart?* set in the provincial asylum for the insane and the British Columbia interior, appeared in 1898 and 1901.⁷⁹ *Hypnotized?* received enthusiastic reviews and was named “Canadian Book of the Year” in 1898, but this high praise may have resulted in part from Mrs. Henshaw’s social status; she can hardly be classed among the great writers of fiction.⁸⁰

By the mid-1890s she and her husband were exploring and climbing in the Selkirk Mountains and the Canadian Rockies, as well as investigating the region’s alpine flora there; in 1896 they went as far as the source of the Columbia River (figure 4.4). While visiting Field, about fifteen miles west of Lake Louise, Julia met botanical artist and writer Mary Schäffer Warren (see below), who taught her how to photograph flowers and shared with her botanical information about the high regions where Mary and her first husband, Charles Schäffer, were then collecting. With help and advice from John Macoun, a Fellow of the Linnean Society, and his son J. M. Macoun, both very familiar with the flora of western Canada, Julia Henshaw brought out a well-illustrated guide to the alpine flora of the Canadian Rockies,

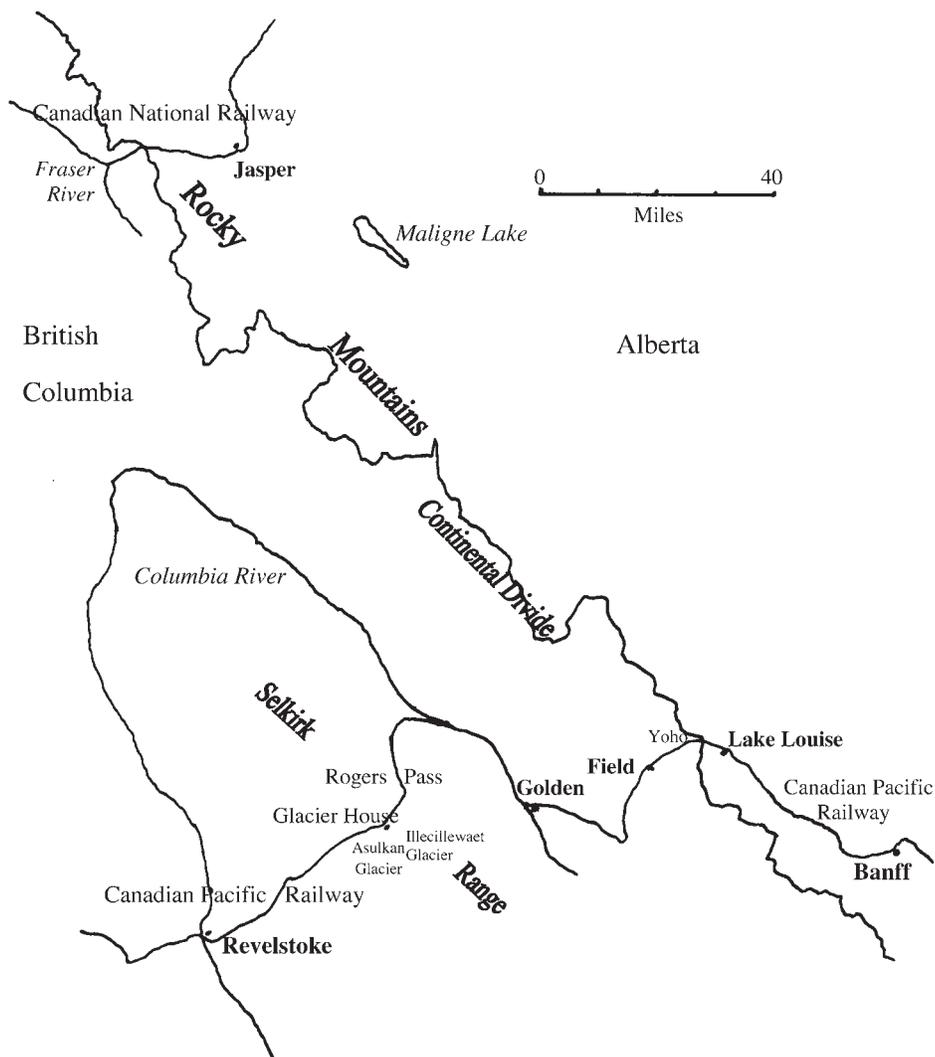


Figure 4.4. Rocky Mountains: Banff, Jasper, and Rogers Pass region.

Mountain Wild Flowers of Canada (1906). Revised and somewhat enlarged, it was reissued as *Wild Flowers of the North American Mountains* in 1915; a final 1917 edition included high-quality colored photographic illustrations.⁸¹ The work, which had the unique feature of indexing by color, quickly became a popular field guide and remained in use for many years.⁸²

Julia Henshaw's climbing in the mountains of British Columbia continued throughout the early 1900s. In 1910, with a companion and the well-known Swiss guide Edward Feuz, who was stationed at Glacier House in the Selkirk Range each summer, she went to the 7,716-foot summit of the now well-known Asulkan Pass in the Selkirks. In 1912, after some earlier reconnoitering of the east coast of Vancouver Island and some short expeditions inland, she and her husband explored the wilderness area of the interior of Vancouver Island in the region of what is now Strathcona Provincial Park. Although government survey teams were already working in the area, much was still unknown territory. As well as exploring physical features, the Henshaws studied the flora and fauna and collected plants. The undertaking won Julia Henshaw admission to fellowship in the Royal Geographical Society when that body finally accepted women in 1913.⁸³ A popular speaker, she presented a talk on Vancouver Island in the society's "Lectures to Young People" series and also at meetings of the Royal Colonial Institute (London) and the Royal Scottish Geographical Society.⁸⁴

Soon after the outbreak of the First World War, Charles Henshaw became head of the Vancouver recruiting center as a civilian with the pay of lieutenant colonel. Julia also joined in the war effort, first as a lieutenant in the Canadian Militia. In 1916 she was sent to Europe to find out what additional supplies and comforts were needed in Canadian hospitals in France. The following year, apparently on her own initiative rather than as a member of the Canadian Militia, she returned to England, where she joined the French Croix Rouge as an ambulance driver. She served in France from March to November 1918. For helping to evacuate civilians from several towns while under enemy fire she was awarded the Croix de Guerre with a gold star, and a number of other medals as well.

After the war she again turned her attention to alpine natural history studies; in 1920 she attended the Allied Congress on Alpinism in Monaco as a delegate of the Alpine Club of Canada. Her talk on the flora and fauna of the Canadian Rockies, repeated twice by request, was illustrated by her outstandingly fine colored slides; the Prince of Monaco, greatly impressed by her presentation, created her an officer of the Order of St. Charles.

Julia Henshaw was one of the original members of the Alpine Club of Canada, joining in 1906; the club's honorary secretary from 1910 to 1912 and from 1914 to 1920, she attended many of its annual camps until about 1925.⁸⁵ In 1931 the club awarded her the special recognition of honorary membership for her contributions to Canadian mountaineering. She was also active in several other clubs and organizations, including the first women's social club in Vancouver, the Georgian Club, established about 1911; the Canadian Society of Authors; the Society of Authors of England; and the Authors' Club (London). For thirty years she held the office of honorary secretary of the Vancouver chapter of the Imperial Order of the Daughters of the Empire (a Canadian organization, IODE, inaugurated in 1902). She does not appear to have joined the Lyceum Club (London), but her conservative views on women's issues, such as her opposition to women's suffrage, would probably have been in conflict with those of many of the club's members. Her daughter Doris married the Ontario financier Walter Grant Morden in 1909. Director of several Canadian corporations and prominent in financial circles in both Montreal and London, Morden went bankrupt during the depression years of the 1930s.⁸⁶

Toward the end of her life, Julia was severely restricted in her activities by a heart ailment, but she stayed on in her house in Caulfield in scenic West Vancouver, assisted by a companion who lived with her for her last ten years following her husband's death. Although blind for two years until she had a successful cataract operation, she continued producing her "Note book" and "Book page" for the *Vancouver Sun* with the help of her companion. She died at her home on 18 November 1937 at the age of sixty-eight.

MARY TOWNSEND SCHÄFFER,⁸⁷ née SHARPLES, later WARREN (1861–1937), was born on 4 October 1861 in West Chester, Pennsylvania, on the outskirts of Philadelphia. Her well-to-do family was of the Quaker persuasion. Mary had a sound education, possibly at one of West Chester's academies, which were among several good educational institutions in the community at that time; she received instruc-

tion in mathematics and natural history, as well as literature and art. Her early interest in natural history was further encouraged by her father, one of a number of enthusiastic West Chester naturalists. She also studied at the State Normal School in West Chester and had tuition in flower painting from George Cochran Lambdin (1830–1896) of Germantown, Philadelphia, a European-trained painter who in his later years produced many popular floral works in natural settings.

Mary Sharples's social life when she was a young woman centered very much in the drawing-room gatherings of Philadelphia's educated and cultured elite. In 1889, when she was twenty-eight, she made her first visit to the wilderness lands of the Canadian Rockies, in the company of a group from the Philadelphia Academy of Natural Sciences. By that time, following the completion of the transcontinental Canadian Pacific Railway line (figure 4.5) and the construction of good hotels and mountain lodges by the railway company, the Canadian Rockies had become accessible to wealthy mountain enthusiasts and naturalists. Around Glacier House (figure 4.4), the railway company's lodge near Rogers Pass in the Selkirks, she did some minor exploring with fellow Philadelphia botanical art student Mary Vaux (see below), who was there assisting in the fieldwork of her two geologist brothers. She also met Philadelphia physician, botanist, and general naturalist Charles Schäffer. Soon after that she married Schäffer and with him returned to the Rockies every summer throughout the 1890s. On these visits she hiked, climbed, or rode Indian ponies on the many excursions she made around the region, including the Lake Louise area, to collect botanical specimens for her husband, who was several years her senior and in poor health. On some of these trips she had the company of geology teacher Molly Adams of New York, with whom she became close friends.

In 1903 Charles Schäffer died, with his planned book on alpine flora still unfinished. Feeling she must bring the work to completion, Mary sought the help of botanist Stewardson Brown, one of the founders of the Philadelphia Botanical Club and a curator at the Philadelphia Academy of Natural Sciences;⁸⁸ she continued collecting in the Rockies, working there with Brown in 1906. Their popular work, *Alpine Flora of the Canadian Rockies*, illustrated with Mary Schäffer's watercolor paintings and photographs, appeared under Brown's authorship in 1907.⁸⁹ She also made lantern slides of her illustrations for use in talks she gave on her visits to the Canadian Rockies.⁹⁰

Having greatly enjoyed her summers in the mountains and being eager to explore farther into the little-traveled areas that had "lured and beckoned us for years," she and Molly Adams went back in 1907 and again in 1908.⁹¹ During both these seasons they had the very considerable assistance of two British guides, Billy Warren and Sidney Unwin. In 1907 these four, with a caravan of eleven horses, set out to reach the headwaters of the North Saskatchewan and Athabasca rivers, following old Indian

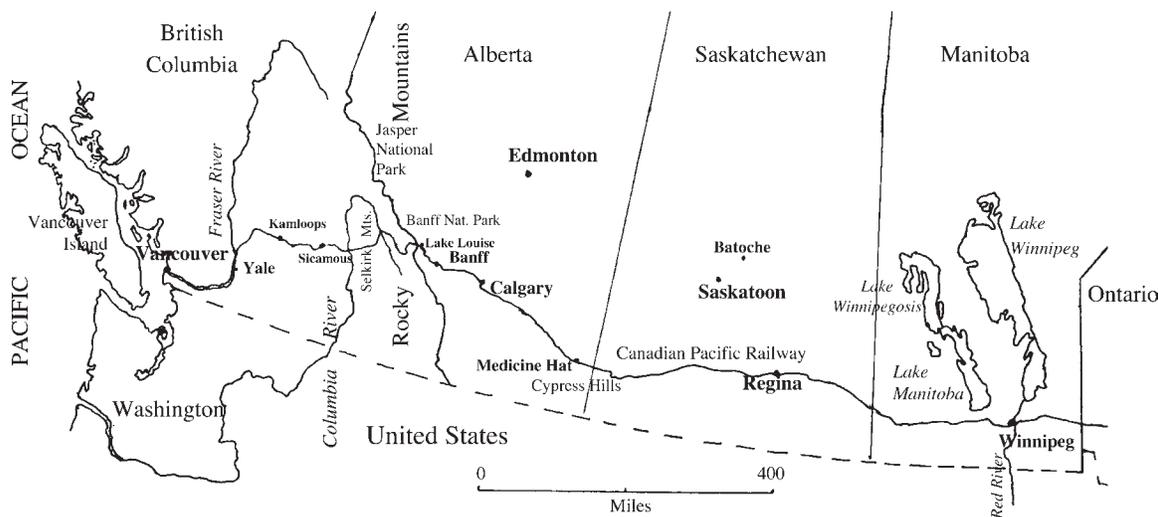


Figure 4.5. Canadian Pacific Railway route, Winnipeg to Vancouver.

trails over Bow Pass and along the Saskatchewan to Brazeau Lake and Fortress Lake, before returning over Howse Pass and Baker Pass to the town of Field on the British Columbia side of the provincial border.⁹² A chance meeting with Sampson Beaver, a Stoney Nakoda Indian, gave Schäffer her first indication that a mysterious lake called Chaba Imne (Beaver Lake) lay to the north of Brazeau Lake; Beaver had seen this lake in his youth and was able to draw a rough map showing its location. Finding Chaba Imne was the main goal of Mary Schäffer's 1908 expedition (figure 4.4).⁹³ Leaving Lake Louise on 8 June 1908, again with Billy Warren and Sidney Unwin as guides, she and Molly Adams struggled through the high, rough country of the area that is now Jasper Park and after a month of difficult going reached the shore of a vast lake (Maligne Lake). After building a crude raft of green logs, they spent several days exploring the bays and inlets of the lake; passing a narrowing at what they supposed was its southern shore, they discovered an even larger and more spectacular stretch of water bounded by high peaks—a vast, untouched wilderness. Schäffer wrote about her explorations during the 1907 and 1908 seasons in her book *Old Indian Trails* and in many magazine and newspaper articles.⁹⁴ She told her story well, with vivid descriptions presented in a warm, conversational style.⁹⁵

Thanks to her writings she became widely known. In 1910 she was asked to survey Maligne Lake by geologist Donaldson Bogart Dowling of the Geological Survey of Canada, who was working in the Jasper Park region at that time. Dowling had suggested to Howard Douglas, commissioner of parks at Edmonton, that a survey would not only provide needed information but, when done by well-known Mary Schäffer, would also help to advertise the scenic grandeur of the region and further efforts to reincorporate Maligne Lake within the boundaries of Jasper Park.⁹⁶ Assisted by guides Sidney Unwin and Jack Otto, Schäffer spent a month at the lake, exploring nearby valleys and surveying the shoreline. Access to the region was now easier, a rail connection from Edmonton being available as far as Jasper.

Mary Schäffer's 1911 trip was her last into the wilds of the Rockies. By then she was fifty and giving much of her time to writing and lobbying for wilderness conservation. She decided to leave Philadelphia and asked her former guide Billy Warren to find a lot and build her a house in Banff. In 1912 she moved to her new home, designed in the style of a spacious country cottage and set among the trees of Grizzly Street; she named it Tarry-a-while. Three years later she and Billy Warren married. He went on to a successful business career in Banff, operating the Alberta Hotel and Cascade Garage; Mary made frequent lecture tours, presenting talks on the Canadian Rockies to American audiences, while at the same time continuing to write and lobby for wilderness preservation. By the time of her death, in Banff in 1939 at the age of seventy-eight, she was widely recognized as one of the foremost authorities on the wilderness areas of the Canadian Rockies. An accomplished artist, photographer, and writer, one of the earliest members of the Alpine Club of Canada, she did much to document the beauty and value of the region that became the Banff and Jasper national parks. Her Banff home is now a museum operated by the Whyte Foundation.

MARY MORRIS VAUX,⁹⁷ later WALCOTT (1860–1940), the only daughter of George Vaux and his wife, Sarah, née Morris, was born in Philadelphia on 31 July 1860. George Vaux, of a well-to-do Philadelphia Quaker family, was descended from eighteenth-century English Dissenter immigrants; his wife's ancestors were also of early colonial stock, one of her forebears being Thomas Wynne, physician and friend of William Penn. The large dairy farm where Mary and her brothers George and William grew up was part of the nearly seven-hundred-acre estate of Harriton, originally called Bryn Mawr, one of the sections of land allotted by Penn to influential immigrants in the 1680s. Now a historic site, the farm was held by a succession of owners or tenants over the years, among them Mary Vaux's family.⁹⁸

She attended the Friends Select School in Philadelphia from 1869 to 1879 and in addition studied drawing and painting. Interested in the natural world and encouraged by her father, she began painting wildflowers when still a child. After her mother died in 1880, she became responsible for running the household and helping with the work of the dairy farm, but nevertheless time was found for travel during the summer months. She and her father made several trips to the American West in the early 1880s, including visits to the mountains and deserts of Colorado, Nevada, and California in 1881 and 1883 and Yellowstone Park in 1885. In 1887 the Vaux family went to the Canadian Rockies for what was to be the first of many visits to the region, recently made accessible via the Canadian Pacific Railway (figure 4.5). Mary's two brothers, both mountain climbers with research interests in glaciology and mineralogy, were at that time eager to investigate the movement of the glaciers of British Columbia

and Alberta, particularly the Illecillewaet (now Illecillewaet) and Asulkan glaciers in the Rogers Pass region; these they would measure and photograph over a period of twenty years. Mary accompanied them on their field trips, on foot or on horseback, assisting in the flow measurements and recording the recession of glacier tongues, as well as helping in their mineralogy studies. The glacier changes, particularly the tongue recession, the Vauxs attempted to link with annual weather changes. Mary became a skilled photographer, a keen amateur naturalist, and an outstanding wildflower painter. She sketched and collected extensively in the region around the family's base at Glacier House, sometimes in the company of fellow Philadelphia floral artist Mary Schäffer, who first joined her in 1889 and with whom she became close friends. An original member of the Alpine Club of Canada, Mary Vaux attended the first of the club's annual camps in 1906; she was made an honorary member in 1914. Her climb of Mount Stephen in Jasper National Park in 1900 was the first by a woman in the Canadian Rockies of a peak over ten thousand feet.⁹⁹

Although her brothers took a great many of the mountain photographs, Mary carried out the subsequent technical work, did all the printing, and assisted in the preparation of tables and other material showing average daily motion of glaciers year by year. This material was used by George and William Vaux in exhibitions in Philadelphia and in talks to various groups such as the Photographic Society of Philadelphia and the Appalachian Mountain Club, as well as in their joint papers published in the *Proceedings* of the Philadelphia Academy of Natural Sciences.¹⁰⁰ The Vaux pictures were also used in other publications, including A. O. Wheeler's *Selkirk Ranges* (1905) and a Canadian Pacific Railway pamphlet advertising the spectacular scenery of the Canadian Rockies. The latter was frequently updated by the Vauxs, the last update being prepared by Mary in 1922. Since the drawings and photographs were often exhibited and published under the name Vaux only, Mary probably received little recognition for her part in their production. However, she was listed as joint author in a short, illustrated work on glaciers brought out with her brother George in 1911.¹⁰¹

During her visit to the Rockies in 1913 she met geologist and paleontologist Charles Doolittle Walcott (1850–1927), whose special interest was Cambrian-period fossils. A former director of the United States Geological Survey and from 1907 secretary of the Smithsonian Institution in Washington, D.C., Walcott had discovered Cambrian fossils in a loose rock from Burgess Shale beds of the Burgess Pass region in 1909; going back with his sons Stuart and Sydney the following year, he located a remarkably rich bed of Middle Cambrian fossils, from which he extracted several thousand specimens over the next fourteen years. Since the British Columbia beds contained a large number of Middle Cambrian animals not always preserved as fossils, the Walcott material, much of which was sent to the Smithsonian Institution, was especially valuable; it has remained so throughout subsequent decades, even though similar deposits have now been found in other parts of the world.

Mary Vaux became the third wife of Walcott, then a widower, in 1914, and over the next ten years returned to the Rockies with him for three or four months every summer, while he continued his work on the Burgess Shale fossils. Accompanying him on his field trips, she collected and sketched at every opportunity, often while pack trains were stopped or being made ready. During the winters at her home in Washington, D.C., she completed the sketches in watercolors and wrote short, descriptive notes while also, as the wife of the secretary of the Smithsonian, being much involved in Washington social circles.

Over the years her collection of wildflower watercolors gradually increased, eventually reaching over one thousand. By the early 1920s her work was becoming known; she exhibited at the Anderson Galleries, Park Avenue and Fifty-ninth Street, New York, in 1924 and was being urged to make a more permanent collection before time began to fade the colors. In 1925 the Smithsonian Institution published a five-volume set of about four hundred lithographed prints. Of outstanding artistic quality and accurate in botanical detail, the paintings illustrated most of the wildflowers of North America and were accompanied by brief descriptions. Although printed in a limited edition of five hundred copies in portfolio, the work became a library reference guide for identification.¹⁰² In 1935 she contributed fifteen paintings to the Smithsonian Institution's reference work on a familiar group of insectivorous plants, the pitcher plants of the *Sarracenia* family. Again brought out in a limited edition of five hundred copies in portfolio, the work included descriptions and distribution notes by botanist and ecologist Edgar Theodore Wherry, then professor of botany at the University of Pennsylvania, and notes on insect associates by Delaware naturalist Frank Morton Jones, a specialist in plant-insect interaction.¹⁰³

Charles Walcott died in 1927, but Mary continued to visit the Canadian Rockies every summer until 1939. Then seventy-eight, she had begun to feel that the mountains had become too crowded to suit her liking; she saw the many tourists who were then visiting the area as caring little about their surroundings.

In 1927 she was appointed by President Calvin Coolidge to a seat on the federal Board of Indian Commissioners, a body of which her brother George had been chairman from 1907 until his death in 1927; she served on the board for six years. Prominent in the Society of Woman Geographers, an organization founded in 1925, she was elected president in 1933; three years later she carried the society's flag to Japan on a botanical research trip for the Smithsonian Institution, collecting wildflowers and preparing watercolor illustrations of her finds.¹⁰⁴

Mary Vaux Walcott died in St. Andrews, New Brunswick, on 22 August 1940, shortly after her eightieth birthday, at the summer home of her American friends Henry and Sarah Phipps Ross. Her name is commemorated in the spectacular 10,502-foot Mount Mary Vaux in Jasper Park, named after her by Mary Schäffer in 1908. She left a legacy of four hundred thousand dollars to the Smithsonian Institution to support geological research and complete writings her husband had left unfinished at his death.

EDITH MAY FARR¹⁰⁵ (1864–1956) was another early twentieth-century woman from the Philadelphia botanical community who took advantage of the opportunities opened by the completion of the Canadian Pacific Railway to explore the flora of the Canadian Rockies.

Following earlier botanical excursions in Maine,¹⁰⁶ Farr carried out her first collecting in the Banff-Rogers Pass region in the summer of 1903. The same year she began studies in the biology course at the University of Pennsylvania,¹⁰⁷ where she was influenced by taxonomist John Muirhead Macfarlane, then professor of botany, who supported and encouraged her collecting activities. She returned to the Canadian Rockies the following summer and, assisted by her friend and fellow collector Olive S. Day,¹⁰⁸ assembled a substantial collection of plants from the region between Banff and Glacier national parks. Edith Farr's ambition, as she stated in her 1904 report, was to carry out sufficient exploration to warrant bringing out "a Flora containing descriptions and illustrations of at least the more conspicuous plants to be seen at Banff, Lake Louise, Field, Emerald Lake, the Yoho Valley and Glacier, these being the principal places of resort along the line of the Canadian Pacific Railway."¹⁰⁹ Although she did not enroll in the university's biology course after 1905, she remained in close touch with Macfarlane and continued her collecting in the Canadian Rockies at least through the summer of that year. A second report describing species she found of particular interest appeared in 1906 and a comprehensive listing, "Contributions to a catalogue of the flora of the Canadian Rocky Mountains and the Selkirk Range," in 1907.¹¹⁰

In her 1904 paper she reported and described seven plants, carefully relating her observations to previous reports by other authors and when necessary consulting experts such as Per Axel Rydberg, curator of the New York Botanical Garden and a specialist on Rocky Mountain flora. Among the plants she described were two species of *Pachystima* (now *Paxistima*), low-growing evergreen shrubs related to *Euonymus*; one of these, *P. macrophyllum*, was a new species. Continuing her investigation of *Pachystima*, she returned to the Selkirks in the summer of 1905 with the particular aim of collecting *P. macrophyllum* in flower and *P. myrsinites* at the fruiting stage. Her 1906 paper set out her conclusions about four species of *Pachystima* that varied strikingly, *P. myrsinites*, *P. schaefferi* (found by Mary Schäffer and named after Charles Schäffer by Farr), *P. macrophyllum*, and *P. krautteri* (found by Louis Krautter and also named by Farr). Her type specimens of *P. schaefferi* and *P. krautteri* were donated to the University of Pennsylvania herbarium.

Although recognized by her fellow botanists as an "able and observant collector," Edith Farr does not seem to have published further botanical work after her studies on Rocky Mountain plants.¹¹¹ Until it ceased to exist in 1927 she maintained her membership in the Botanical Society of Pennsylvania, a group organized by Macfarlane in 1897.

In 1913 she reenrolled at the University of Pennsylvania, this time in a college course for teachers. Again without taking a degree she continued studies in that area intermittently over the next ten years. In 1941–1942, when she was in her seventies, she took one additional course in the university's School of Education. She lived in Philadelphia, near the university, until 1922, but later moved to Bryn Mawr,

where she died on 4 January 1956. Her name is commemorated in the low-growing shrub *Salix farrae*, a member of the willow and osier genus, first found by her at Field in Yoho Park, British Columbia, in June 1904. The complete description establishing *Salix farrae* as a separate species appeared in 1934.¹¹²

Yukon and the Northwest Territories

GERALDINE MOODIE¹¹³ (1854–1945), née FITZGIBBON, botanical artist and early photographer of the western prairies and the eastern Arctic, was the second daughter in the family of four surviving children of Colonel Charles Thomas Fitzgibbon, a barrister, and his wife, Agnes, née Moodie, the botanical artist who had illustrated Catharine Traill's botanical works. As the granddaughter and the grandniece of two of Canada's best-known early women writers (Susanna Strickland Moodie and Catharine Parr Strickland Traill respectively) Geraldine represents the third generation of Strickland women endowed with notable artistic talent and creative drive.

Born in Toronto on 31 October 1854, she was eleven when her father died, leaving the family with limited financial resources. Geraldine learned flower painting from her mother and when still in her early teens was able to help her mother in her floral illustration undertakings, work that gave her a basic grounding in techniques of pictorial documentation of plant life. In 1870, following her mother's marriage to Lieutenant Colonel Brown Chamberlin, a member of Parliament, the family moved to Ottawa. On a visit to England in 1878, Geraldine met and married a distant cousin, John Douglas Moodie. Within a short time she and her husband returned to Canada, settling north of Brandon, Manitoba, where they intended to take up farming; Geraldine sketched landscapes and painted watercolors of prairie wildflowers in her spare time. John Moodie's experiment in farming turned out to be brief and less than successful. The family moved to Ottawa in 1885, and John joined the North-West Mounted Police, eventually rising to the rank of superintendent.

During the thirty-two years her husband was a member of the force, Geraldine's life was one of frequent travel throughout western Canada and the Hudson Bay district of the eastern Arctic, a life that gave her great opportunities for plant study. In 1891 the Moodies moved to Battleford, north-central Saskatchewan, one of the centers of serious fighting in the Cree uprising only seven years earlier when the town, with its contingent of mounted police, was held under siege for a short period. About that time she began to experiment with photography, which by then had advanced technically well beyond the cumbersome and demanding wet-plate procedure to the much easier gelatin dry-plate process. Within a short time, as her six children became older, she opened a photographic studio in Battleford, the first such venture undertaken by a woman in a prairie community. As well as taking portraits, very much in demand in late Victorian society, she photographed North-West Mounted Police, documenting the presence of the force in the region; particularly notable historically are her pictures of Cree elders and

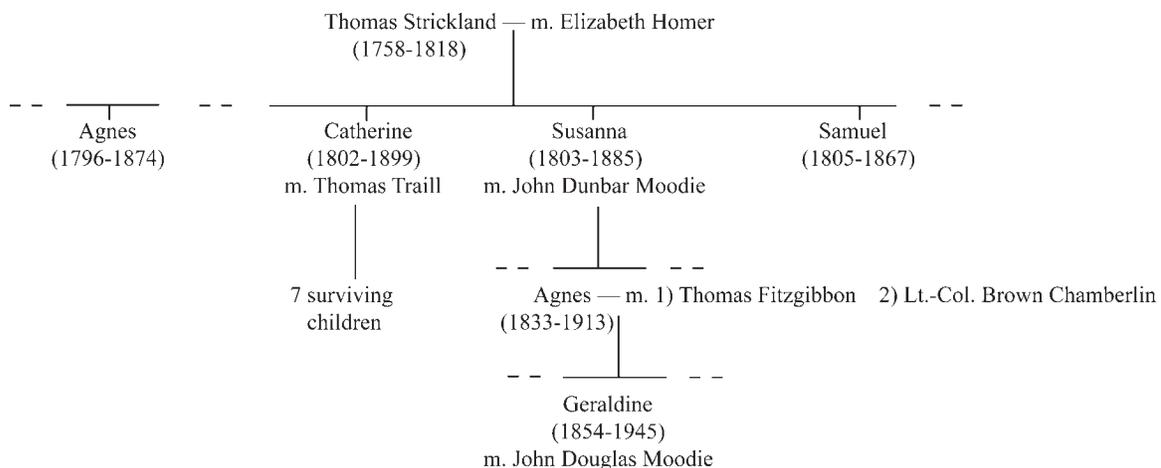


Figure 4.6. Partial family tree showing Strickland ancestors of Geraldine Moodie.

chiefs, including chiefs Thunderchild and Poundmaker, and her photograph of a sun dance ceremony. Considering the still-recent conflict between the Crees and the Mounties and Geraldine Moodie's close connection with government law enforcement, the fact that she was permitted to photograph a sun dance ceremony is all the more remarkable. In 1895 she was commissioned by the Canadian prime minister, Mackenzie Bowell, to photograph sites throughout the region related to the 1884 and 1885 uprisings.¹¹⁴

Following a move in 1897 to the recently established community of Maple Creek in the botanically rich and varied Cypress Hills region of southwest Saskatchewan, Geraldine Moodie opened a new studio; she also started a branch in Medicine Hat, Alberta, fifty-five miles to the west. Having a housekeeper, she was able to spend periods of two weeks at a stretch traveling around the country by carriage, taking photographs of prairie plants and building up a pictorial record of the lives and work of ranchers and cowboys. She would then return to her studio to develop and print her pictures and also to hand-color many of her wildflower photographs.

Her first stay in the Arctic came in 1904, when she and one of her sons went north by steamer accompanying her husband, who had been appointed governor of the Hudson Bay District. They were stationed at Fullerton, near Southampton Island at the entrance to Hudson Bay. During the year she was there she was formally the station's secretary but in fact took on the work of regional photographer as well, since the man holding the official appointment to this post was, in her husband's opinion, of lesser ability. Her photographs of Inuit and First Nations peoples, as well as of Arctic plants, went to the North-West Mounted Police headquarters, Ottawa, to the Department of Marine and Fisheries, and to Prime Minister Wilfrid Laurier.

In the period between 1906 and 1909, when she lived at Fort Churchill, her Arctic photography continued; she often accompanied her husband on police patrols on both land and sea and so came to know the country well. During John Moodie's subsequent postings, which included a period in Regina in 1910–1911, she kept on taking pictures, but the Arctic wilderness remained her favorite place. After Moodie retired in 1917, they settled on the ranch they had bought in the Cypress Hills, later going back to the community of Maple Creek, where they had lived several years earlier. In 1936 they moved to British Columbia. Geraldine Moodie died in Alberta on 4 October 1945, less than a month before her ninety-first birthday. Burial was in Calgary.

Since Geraldine Moodie, unlike her grandmother, grand-aunt, and mother, did not press on to publish her work, she and her legacy were forgotten for most of a century. Collections of her floral watercolors and photographs still exist, housed in various government departments, public archives, and Royal Canadian Mounted Police museums; taken together they form a modest but worthwhile contribution to early botanical records.

MARTHA LOUISE BLACK,¹¹⁵ née MUNGER, then PURDY (1866–1957), plant collector and floral artist, many-year Yukon resident, and member of Parliament for Yukon for five years, was the eldest of the three surviving children of wealthy and socially prominent Chicago businessman George Munger and his wife, Susan, née Owens. George Munger was descended from an old Connecticut family; his wife, from Owensville, Kentucky, was a daughter of the owner of a large plantation and several Ohio River packet boats. Martha was born in Chicago on 26 February 1866. Although devastated by losses in the Chicago Fire of 1871, George Munger successfully restored the family's fortunes; over the next two decades he expanded his laundry business into a chain operating throughout various parts of the country and bought a sugar plantation in the West Indies and a ranch of two thousand acres on the Kansas-Oklahoma border.

Martha had two years of instruction at a high school and was then sent to Lake Forest Select Seminary for Young Ladies. After too many failures to abide by the seminary's rules and regulations, she was withdrawn and enrolled at St. Mary's, a well-established private college for women near South Bend, Indiana, run by the Sisters of the Holy Cross. During her five years there, elocution and botany were her favorite subjects. A year after her graduation in 1886 she married Will Purdy, a graduate of Morgan Park Military Academy in Chicago's affluent Beverly-Morgan Park area and a son of Warren G. Purdy, for a time president of the Chicago, Rock Island and Pacific Railroad. In the next five years she had two sons, but by the early 1890s she began to look for interests beyond those of her suburban home in the community of Walden, ten miles outside Chicago. She joined the women involved in plan-

ning events and ceremonies that were part of the 1893 Chicago World's Fair, and during the period of economic depression that followed she worked with Jane Addams at Hull House, one of Chicago's settlement houses.¹¹⁶

When news of gold in the Klondike reached Chicago in 1897, Will Purdy, tired of his job as assistant paymaster in his father's railroad company, joined his equally wealthy friend Eli Gage in making plans to try their luck in the Yukon.¹¹⁷ Martha's younger brother, George Munger, decided to go too, and Martha, by then thirty-two and eager for adventure, left her two young sons with her parents at their Kansas ranch and joined the group. Once on the West Coast, Will Purdy changed his plans, abandoned the idea of gold prospecting in the Yukon, and took ship for Hawaii. Declining to accompany him, Martha, with her brother, sailed up the Inside Passage from Seattle to Skagway, Alaska, and then to the small camp of Dyea, the starting point for the old Indian route up the Chilkoot Trail into the Yukon (figure 4.7). Here they spent some days preparing themselves for the trip ahead to Dawson, the center of the 1897–1898 gold rush; here also Martha for the first time saw the glories of the northern wildflowers in summer, whole hillsides of wild iris and blue lupine. Having hired packers to carry their supplies, they joined the line of men and animals struggling up the narrow, slippery, rocky trail over the 3,500-foot pass and on to Lake Bennett, in all a journey of forty miles. While waiting for three weeks at the lake for their supplies to catch up with them and their boat to be built, Martha explored the flora of the surrounding country and picked large quantities of wild berries of many varieties. The last lap of their journey of several hundred miles, from Lake Bennett to Whitehorse, through the seething cauldron of the White Horse Rapids and up the Yukon River, took them to Dawson. En route they staked claims that later yielded a considerable quantity of gold.

A community of tents, shanties, and log cabins, Dawson was surrounded by less-rugged country, high hills rather than mountains. Martha's party built a cabin one and a half miles outside Dawson and made some rough furniture. The special mission Martha had taken on of tracing a claim of relatives of a dead prospector proved fruitless, but by winter she had other matters to occupy her attention. The following February her third son, Lyman Purdy, was born; he immediately became the camp's main attraction and their cabin a social center for the surrounding community.

By April Martha was exploring the surrounding hills for spring flowers; she noted eleven members of the Ranunculaceae family, including the pasqueflower that turned whole hillsides purple, the long-fruited anemone (*Anemone cylindrica*), and the masses of yellow water crowfoot growing along the stream banks. In the long Arctic summer evenings of June, while her brother and his friends took care of the baby, she botanized over the sandy hills within a few minutes' walk of her cabin. Among the plants she recorded were the small evergreen herb shinleaf, of the genus *Pyrola*; the Arctic poppy (*Papaver radicum*); Virginia bluebell; the blue-flowered herb Jacob's ladder; many varieties of the *Orchis* genus of the orchid family, including the Siberian orchis or Franklin's lady's slipper (*Cypripedium passerinum* Richardson, also known as sparrow's-egg lady's slipper); and the leafy white orchis (*Habenaria dilatata*, scent-bottle or bog-orchid); as well as the coral-root orchid (*Corallorhiza maculata*) and members of the *Calypso* genus. By July, goldenrod and magenta vines blazed along the banks of the Yukon River.

Somewhat reluctantly, at the end of July Martha, with her young son, left Dawson, her father having come north, determined to take her back to Kansas. The journey was now a great deal easier, with river steamers along much of the route to Whitehorse and a new, narrow-gauge rail connection over White Pass to Skagway. But she greatly missed the challenge and adventure of pioneer life in Dawson, and as soon as she heard from her brother that her claim had been productive, she went back to Dawson, accompanied by her twelve-year-old eldest son, Warren; she now had the added freedom of action of being formally divorced. Plans were made for her father, mother, and the two younger boys to follow the next year. She established herself at Gold Hill, a mining camp near Dawson (figure 4.7) and formed a claim-working partnership with two men. A cabin, storehouse, and bunkhouse for sixteen men was built in time for the arrival of the family in 1901. Her father brought with him a Two-stamp Tremaine Prospecting Mill, a sawmill, and a hydraulic motor; the latter was installed at the claim site, and the two mills were set up a mile above Dawson, on the left bank of the Klondike River on thirty acres of land whose surface rights were bought from the Canadian government. They also built a fine, six-room cabin, several one-room cabins, and an assay office. When her parents left in 1902, taking Warren with them for his schooling, Martha remained in Dawson as mill manager.

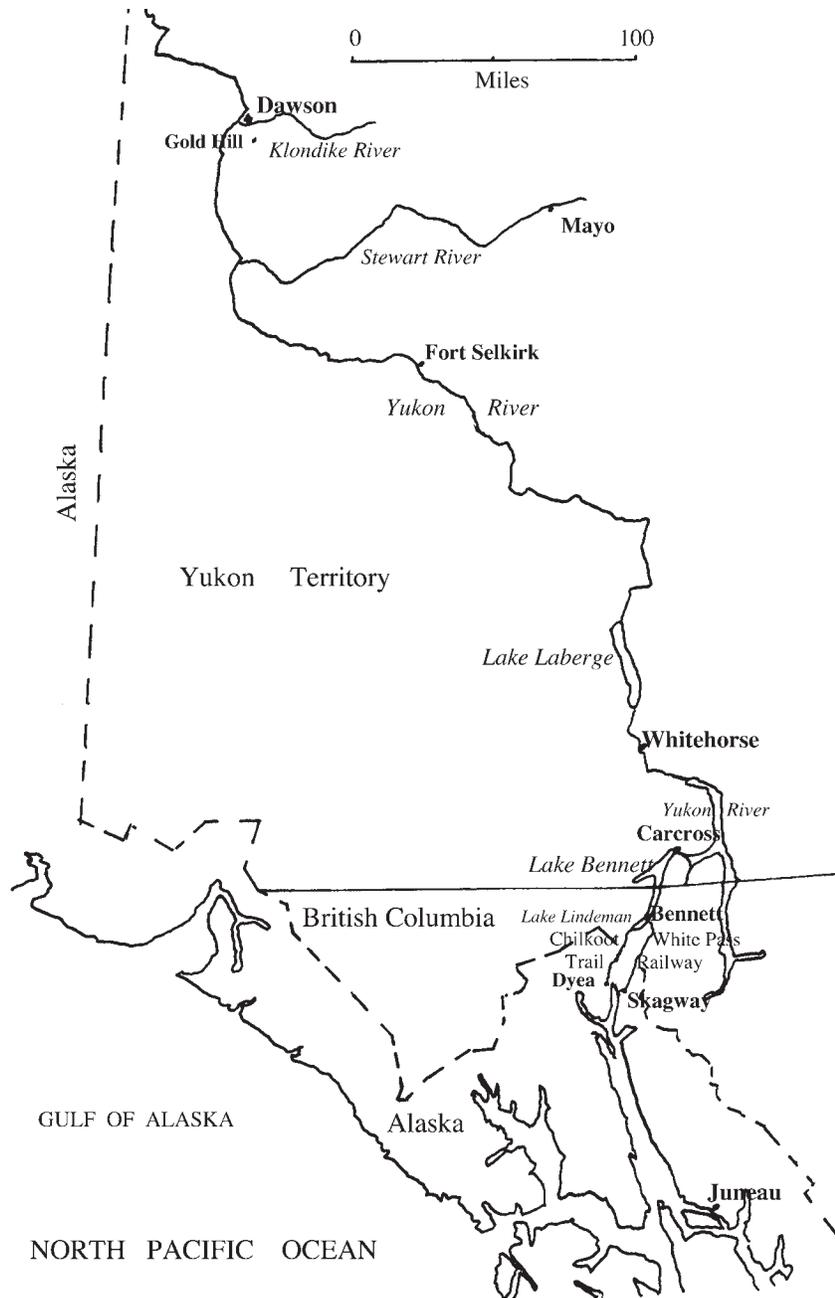


Figure 4.7. Yukon Territory, Canada.

Despite early trouble with a misogynist foreman that forced her to replace her whole workforce on short notice, the sawmill did very well during Martha's first three years in Dawson. In July 1904 she married George Black (1873–1965), a New Brunswick lawyer she had met in 1902 when seeking legal advice on mill business. At age twenty-four, Black, a man with strong empire loyalist and conservative leanings, had joined the Klondike Gold Rush but fairly quickly concluded that a career in law was more profitable for him, although he had done fairly well as a prospector. Like Martha, he greatly enjoyed the outdoors, and he won the affections of her boys by including them in his hunting expeditions.

Within a few years Martha Black's interest in wildflowers became known, and she was invited to address various groups on the topic. Her talks were illustrated with pressed and mounted flowers, the backgrounds washed in with watercolors, and she stressed that she was not a "scientific" botanist but did "artistic botany." About 1908 she entered a competition set by the Yukon government for the best exhibit of native wildflowers that showed as many varieties as possible. Helped by children and miners, she assembled a collection of 464 varieties; she mounted whole plants to emphasize the botanical angle and produced artistic effects by unusual arrangements. The exhibit not only won the two-hundred-dollar prize but was sent on to the Alaska-Yukon-Pacific Exposition held in Seattle from 1 June until 16 October 1909; initially planned for 1907 to mark the tenth anniversary of the Klondike Gold Rush, it was a well-attended fair that attracted over 3.7 million visitors before its closing.

Active in politics, George Black served three terms in the Yukon Council, but by 1909, with Dawson's population dwindling and legal work much reduced, he decided to move to Vancouver and study for British Columbia law examinations. With Martha's work in "artistic botany" having become fairly widely known by then, she was commissioned by the Canadian Pacific Railway to gather and mount wildflowers of British Columbia and the Rockies, her designs to be used in Canadian Pacific stations, hotels, and chalets as additional tourist attractions. Provided with suitable railway travel arrangements and accommodation en route, she collected along the line from Yale, British Columbia, to Banff, Alberta (figures 4.4 and 4.5). Near Sicamous on Shuswap Lake, about sixty miles east of Kamloops, she found striking expanses of scarlet Indian paintbrush (prairie-fire), as well as surprisingly large areas of the fairly rare yellow orchid (*Cypripedium pubescens*). At Glacier she collected species of the violet and lily families, including the glacier lily, or dogtooth violet (*Erythronium grandiflorum*), mountain larkspur (*Delphinium* genus), and yellow columbine (*Aquilegia* genus). The area around Field was rich in orchids—coral-root, lady's tresses, *Calypso*, white bog-orchid (*Habenaria dilatata*), and the rare white *Cypripedium passerinum*—while the countryside around Lake Louise had Arctic poppies, pansies that were as large as those in the Yukon, and especially fine wild strawberries. At Banff, where she met her fellow Rocky Mountain flower collectors Julia Henshaw and Mary Schäffer (see above), she was accommodated in the Canadian Pacific Railway hotel that became her headquarters for several weeks of exploration, during which she was joined by her father. On a four-day horseback excursion up the Yoho Valley from Field she came upon the Smithsonian Institution's paleontology specialist Charles Walcott, who was extracting large quantities of rare Middle Cambrian fossils from the rich Burgess Shale beds of the Burgess Pass area. Concerned that this valuable material was being taken out of Canada for Smithsonian Institution collections, Martha contacted Ottawa; later she learned that Walcott's material had been divided, some going to the National Museum of Science and Technology, Ottawa (see the section on Mary Vaux Walcott, above). Before she left the high country, she had the pleasure of seeing the autumn flowers in bloom—wild asters, including purple fleabane (*Erigeron pygmaeus*), and golden gaillardia or blanket flower, harebells, mountain lily (*Ranunculus lyallii*), and goldenrod.

Not long after completing this project for the Canadian Pacific, she was asked by the Belgian government to carry out similar work, but since this would have meant spending three years in Belgium, she reluctantly declined the invitation. In 1924 and 1925 she prepared other flora exhibits for the Canadian Pacific, which were included in Canada's contribution to the 1924–1925 British Empire Exhibition at Wembley, London.

The family returned to Dawson in 1912, George Black having been appointed commissioner of Yukon Territory by the Conservative government in Ottawa following his strong support of Conservative candidates in the federal election of 1911. But Martha's residence in Government House, Dawson, lasted only a few years. With the outbreak of war in August 1914, Yukon men began enlisting. By the spring of 1916 George Black sent in his resignation as seventh commissioner of the Yukon and joined the work of organizing the Yukon Infantry Company of the Canadian Expeditionary Force, which he led with the rank of captain; his stepson, seventeen-year-old Lyman, was one of the first to join. Martha accompanied the 275-man company, first to their training camp at Victoria, Vancouver Island, then to Halifax and across the Atlantic; she was the only woman on the SS *Canada* for the eight-day trip. In London, where she remained when the Yukon Infantry was sent to France, she administered the

Yukon Comfort Fund and visited hospitalized Yukon soldiers, as well as acting as correspondent for the *Dawson News* and the *Whitehorse Star*. She also made frequent train journeys throughout Britain, presenting lectures on the Yukon to audiences that varied from fifty to seven hundred people; the most strenuous of her trips took her to South Wales for a period of three weeks. These lectures, which totaled almost four hundred, were well illustrated with lantern slides that showed the majestic wilderness of the Yukon mountains, lakes, and river valleys in all the seasonal variations of their spectacular flora. The work resulted in her being elected a fellow of the Royal Geographical Society on 18 June 1917, a notable honor for a woman at the time.¹¹⁸

Wounded at Amiens in August 1918, George Black was sent back to London, but after the armistice he joined the Rhine Army of Occupation, of which the Canadian Corps formed an important part. Lyman also survived the fighting and was awarded the Military Cross for notable bravery; later, under Colonel Muerling, Yukon Machine Gun Battery, he was given command of the armored cars in the historic official entry into Mons, one of the Belgian villages liberated in November 1918 by Canadian troops led by Canadian Lieutenant General Sir Arthur Currie. In the spring of 1919 Martha went to France, sent by the London-based Overseas Club to inspect military cemeteries and visit war-devastated villages to investigate restoration and reconstruction programs. Before returning to Canada she had the honor of representing the Yukon at a Buckingham Palace garden party, in the course of which King George asked her about her lecture work.

The Blacks settled in Vancouver after the war, George opening a law office. Martha returned to her interest in plants, kept a fine garden, and also gave illustrated talks on the Yukon and on the wildflowers of British Columbia. George Black's previous position, that of commissioner of the Yukon, had been abolished in 1918 and Government House, Dawson, closed. He returned to politics in the federal election of 1921, winning a hard fight in which he retrieved the Yukon seat for the Conservative party, a seat that he held until 1935. For the five years 1930 to 1935, when he served as Speaker of the House of Commons, Martha was the official house hostess at functions of national importance, a role she performed with style and flair.

During this period of residence in Ottawa, the Blacks returned to Dawson during parliamentary recesses. Martha's plant explorations continued, one known extant collection of her specimens being that in the National Herbarium of Canada, Ottawa. Consisting of a few plants from around the village of Mayo (figure 4.7), a mining center for silver-bearing lead-ore deposits about 110 miles east of Dawson, this 1927 collection is included among "the more important collections of vascular plants made in the Yukon;"¹¹⁹ it is also listed in Swedish botanist Eric Hultén's "History of botanical exploration in Alaska and the Yukon . . ." and in his *Flora of Alaska and Yukon*.¹²⁰ Throughout the early 1930s Martha also continued her artwork, and a number of her floral designs from these years are in the MacBride Museum, Whitehorse. Among them are her yellow lady's slipper orchid, her dwarf everlasting (pussy-paws of the genus *Antennaria*), and the small, reddish-brown flower balls of the dockweed (*Rumex crispus*). These works consist of dried, pressed flowers held against a watercolor background with the initials MB and the year made. The flowers are kept in place by a fine cream-colored netting and framed with a gold-edged, cream mat board, the whole held in place by glass and completed with a gold-painted wooden frame.¹²¹

When in January 1935 George Black became ill and was unable to run in the upcoming federal election, Martha ran in his place. At age seventy she campaigned vigorously as an Independent Conservative throughout the two-hundred-thousand-square-mile constituency, the largest in Canada and the smallest in population, with 1,805 registered voters. The undertaking must have made her familiar with much of the Yukon landscape; although she could reach many constituents by boat or two-horse team, she once walked several miles to visit three voters. The Conservatives were defeated nationally, but Martha Black held the Yukon by 134 seats (7 percent of the vote) and took her place in the House in January 1936 as Canada's second female member of Parliament. It was a notable opening that year, being the first in the reign of King Edward VIII, as well as the first for Canada's new governor-general, Lord Tweedsmuir (John Buchan), the well-known author of adventure stories. Martha worked hard on Yukon concerns in the House of Commons but also spent some time with Elizabeth Bailey Price, the coauthor for her planned book, *My Seventy Years*. In 1937 she suffered a severe blow, with the deaths

of two of her sons, Lyman and Warren. These losses were followed by the death from tuberculosis of her brother George Munger the following February.

George Black returned to the Yukon seat in 1940 and was reelected in 1944, the same year the Blacks moved their place of residence from Dawson to Whitehorse; the latter by then had replaced Dawson as the Yukon's major center, and it became increasingly so after the construction of the Alaska Highway, which bypassed Dawson. Martha joined fully in Whitehorse social life, especially after George Black gave up politics in 1949; she became a member of the Imperial Order of the Daughters of the Empire (IODE), organizing three of its chapters, and she also gave her support to the Victorian Order of Nurses.

Over the course of about ten years starting in the late 1930s, she brought out several works about the Yukon. The first of these was her autobiography, first published in 1938 and several times updated and republished under slightly different titles; it serves as a valuable record of frontier life in Canada's far north, from the momentous Klondike gold rush days through the opening decades of the twentieth century. Not as widely known are her three works featuring illustrations of Yukon flowers. All three appeared during the 1940s, when her duties connected with her husband's parliamentary work in Ottawa had lessened or ceased. The most comprehensive was *Yukon Wild Flowers*, which included one hundred illustrations from photographs taken by George Black. *Memories of a Yukon Summer*, a twenty-page booklet coauthored with her husband, was likewise a collection of photographically illustrated wildflowers, together with brief descriptions. *Klondike Days*, while in large part an account of frontier and pioneer life in the Yukon, included a chapter entitled "Yukon and her Flowers"; the booklet's front cover shows two purple-petaled pasqueflowers.¹²²

In addition to the floral artworks already mentioned and the small specimen collection in the National Herbarium, Ottawa, Martha Black's contributions to early Yukon botany include a set of colored postcards, some painted by her about 1930 for the Canadian government, and others prepared for *Klondike Days*. The flowers illustrated (with locations and dates when found if these were recorded) are as follows: pink everlasting, *Antennaria parvifolia* [or possibly *A. rosea* Eaton], Whitehorse, 1925; blue lupine, *Lupinus perennis*, 1925; common fireweed, *Epilobium angustifolium*, the Yukon provincial flower, 1930; monkshood blue bonnet, *Actonitum delphinifolium*, Mayo Lake, 19[27?]; yarrow, *Achillea millefolium*; Sitka columbine, *Aquilegia formosa*, Skagway, 19[20?]; crane's bill, wild geranium, Whitehorse, 19[28?]; Scottish heather, from imported seed, Vancouver, 19[20?]; yellow lady's slipper, *Cypripedium parviflorum*, Kingsmere, Ontario, just northwest of Ottawa, 1930; vetchling, *Lathyrus boreal*, Selkirk, Yukon [115 miles south-southeast of Dawson], 1941; mountain phlox, *Polemoniacae*, [possibly the genus *Linanthus*], above Carcross [on Lake Bennett, about forty-five miles south of Whitehorse]; pasqueflower, *Pulsatilla patens*, 1955.¹²³

In recognition of her cultural and social contributions to the Yukon, Martha Black was honored with an OBE (Officer of the Order of the British Empire) in 1948. She died in Whitehorse on 31 October 1957 at the age of ninety-one and is buried in the Whitehorse city cemetery. In 1984 the Canadian Coast Guard light icebreaker *Martha L. Black* was launched at the Vancouver yards; destined for service in the Beaufort Sea and then in eastern Canada, the ship is a fitting memorial to this sturdy pioneer who found so much enjoyment in the northern wilderness and became something of a legend in the Yukon. In 1997 Canada Post issued a forty-five-cent stamp in her honor.

In the early 1860s, following her marriage to naturalist and Hudson's Bay Company fur trader Bernard Ross, CHRISTINA ROSS¹²⁴ (b. 1840) began collecting butterflies of the Canadian Arctic region; her specimens enriched the holdings of a large number of museums.

Christina was the sixth child in the family of eleven children of Donald Ross of Denny, Stirlingshire, Scotland, and his wife, Mary, née McBeath. She was born on 25 December 1840 at Norway House, the Hudson's Bay Company post at the northeast corner of Lake Winnipeg in what was then the territory of Rupert's Land, now Manitoba. Donald Ross was chief factor for the Hudson's Bay Company in the Norway House region.

In 1860 Christina married Bernard Rogan Ross (1827–1874), a Scot born in Londonderry and educated at Foyle College, a Derry grammar school with ancient roots, now part of Foyle and Londonderry College. Ross arrived at Norway House as an apprentice clerk of the Hudson's Bay Company in 1843. He rose quickly through the ranks, becoming a chief trader at the age of twenty-nine, and by 1858 was

at Fort Simpson, the company's trading post at the confluence of the Liard and MacKenzie rivers, a small permanent settlement from 1822. From his base there he had charge of the whole MacKenzie River district.

Like a number of other Hudson's Bay Company men, Bernard Ross was keenly interested in natural history. After her marriage, Christina, who had three children, joined her husband's wide-ranging collecting activities, concentrating especially on Lepidoptera from regions around company posts, particularly in the area around Fort Simpson. Many of her specimens were sent to Lepidoptera specialist W. H. Edwards,¹²⁵ who in turn passed them on to Spencer Baird of the Smithsonian Institution, Washington, D.C. Christina also gave Lepidoptera collections to the Montreal Natural History Society, and some of her specimens may have been part of the insect collections sent by Bernard Ross to various major institutions, including the Royal Scottish Museum, Edinburgh, and the British Museum.¹²⁶

Three examples of captures of new species made by her are described in an 1863 paper by Edwards, two of them (*Colias helena* and *Lycaena amica*) from the MacKenzie River area and the third, taken in 1863, from the portage at Slave River, about three hundred miles to the east of Fort Simpson. The latter, a large yellow and orange butterfly of the Pieridae family (subfamily Anthocharinae), Edwards named *Colias christina* in her honor; it is also known as Christina's sulphur. The specimen may well have been caught during a stay by the Rosses at one of the Hudson's Bay Company posts such as Fort Resolution in the Slave River area after the family left Fort Simpson in 1862.

Little has been recorded of Christina's later life, although Bernard Ross is known to have been in the Red River Settlement, near present-day Winnipeg, in 1869–1870, the time of the Métis Red River Rebellion led by Louis Riel, which brought about the creation of the province of Manitoba in 1870. Ross retired in 1871, the Hudson's Bay Company trade monopoly having been abolished and the company's territory ceded to the Canadian Confederation.

Notes on Women's Participation in Astronomical Activities

Only one Canadian woman actively interested in astronomical and meteorological studies, Nova Scotia resident Alice Porter, is listed in the Royal Society's 1800–1900 *Catalogue*. As was already noted for South Africa, Australia, and New Zealand, few women took part in astronomical studies until well into the twentieth century, but at least by the 1890s several were joining the earliest of the astronomical clubs. A brief background note is perhaps in order.

The cosmology of the native peoples of what is now Canada is only beginning to receive serious attention, but a recent work on Inuit astronomy presents an account of an ancient, almost forgotten Arctic cosmology that stretched from the Bering Strait to east Greenland.¹²⁷ Astronomical observations played an important role in navigation, time telling, and weather prediction for the Inuit, as well as featuring prominently in religious ceremonies.

Farther south, the native peoples of the western plains of Saskatchewan and Alberta built stone structures that may have functioned as calendars. These "medicine wheels," often consisting of a central cairn with spokes radiating to an outer stone circle, are especially numerous in Alberta, where 66 percent of all those known are located. The mythology surrounding the medicine wheels and their possible astronomical purposes remains something of a mystery.¹²⁸

Although the early French explorers in eastern Canada kept records of the places they visited, including latitude records obtained by the use of astronomical instruments, the first sky observations by Europeans were carried out by the Jesuit missionaries in the early seventeenth century, notably sightings of comets and eclipses included in the reports they sent back to France.¹²⁹ The use of astronomical instruments to solve the practical problems of drawing accurate maps and telling time continued through the period of early settlement, and only in the mid-nineteenth century were the earliest astronomical observatories in Canada built and equipped. The first was a temporary observatory to investigate terrestrial magnetism and meteorology constructed in Toronto in 1840 by the British Ordnance Department.

The first formal amateur astronomical group founded in Canada, the kind in which women might be expected to participate, was that started in Toronto in 1868, soon after the Leonid meteor shower of that year. Several women were among the eight guests at the second regular meeting of this group,

the Toronto Astronomical Club, in February 1869. Over the next two decades the club had its ups and downs, as well as two name changes, but by 1890, reincorporated under the title the Astronomical and Physical Society of Toronto, the club had increased its activities markedly. Among the members who joined at that time or soon after was the first woman, Miss A. A. Gray; corresponding members included astronomy historian Agnes Clerke and the popular lecturer and writer on astronomical subjects Mary Proctor.¹³⁰ Mary Proctor's talk in November 1891 on the Lick Observatory at Mount Hamilton, California, was one of the first in the program of open meetings introduced by the society about then.

Throughout the 1890s and the early 1900s, branches of the Toronto society (recognized as a national organization, the Royal Astronomical Society of Canada, from 1903) were established in other Canadian cities. The notably active branch founded at Meaford on Georgian Bay, Ontario, in 1893 had a woman, Mrs. Henry Manly, as its vice president. At Winnipeg, where an earlier astronomical group incorporated into the national society in 1910, two women, Mrs. L. B. Ireland and Mrs. Kemp, were council members. Likewise, branches at Regina and Guelph, opened in 1910 and 1911 respectively, had women members on their councils. When special sky events such as the arrival of a comet occurred during the summer season, many of the centers organized "summer star parties," at which significant numbers of participants were women. The Ottawa center, started in 1906, was especially notable for its popular evening meetings, which attracted large audiences that almost certainly included women.¹³¹

It was at Kingston, however, at the other end of Lake Ontario from Toronto, that the province's first astronomical observatory was set up. In 1855, with funds provided by the city corporation and by citizens whose interests had been aroused by the solar eclipse of May 1845, a structure known as Kingston Observatory was built in what is now City Park. The observatory was managed by a group of gentlemen amateurs, but from the beginning Queen's College, Kingston, was much involved in the work carried out there. By 1861 an agreement had been reached to transfer the facility to the college, in return for the provision of a number of civic services, which included six public lectures annually. Twenty years later the observatory was moved to a new site on Queen's College campus. Only in 1891 did astronomy teaching begin at Queen's. The list of physics courses in the university calendar for 1891–92 included the statement that "Fortnightly lectures and examinations in Astronomy by the Professor of Astronomy are to be attended by all students in the Junior Class in the Department of Physics." Although Queen's University, founded as Queen's College in 1841, was the first in Canada west of the Maritimes to allow women into its classrooms, and by 1878 had opened all arts and science courses to women, it is unlikely that many women students were studying physics at the junior level at that time.¹³² (See also the section on Queen's University, below.)

Another Canadian observatory built in the 1850s was that at King's College in Fredericton, New Brunswick, now the University of New Brunswick. Known as the Brydone Jack Observatory, it was named after Scottish immigrant Brydone Jack, a graduate of St. Andrews University, who was professor of mathematics and physics at King's College from 1840. Largely through Jack's efforts, the observatory was completed and a telescope installed by 1851, which makes it the oldest astronomical observatory in Canada. Among Jack's significant scientific contributions was the determination of the longitude of Fredericton and later of other places in New Brunswick by use of an electric telegraph link with Harvard (then the "prime meridian" for North America); Jack's successful attempt was the first time the method had been used. There were many amateur astronomers in the Maritimes, and interest in astronomy was well established. Brydone Jack's series of public lectures to audiences in Fredericton and St. John did much to encourage this interest. His subjects included topics such as the form and dimensions of the Earth and the measurement of the distance from the Earth to the Sun, questions that were also being discussed at great length in mid- and late-nineteenth-century Britain.¹³³

The published contributions of ALICE PORTER (fl. 1890s) of Yarmouth, Nova Scotia, consist of two notes on astronomical and meteorological topics published in *Science* in 1893 (see bibliography). The first was her part in a discussion carried on with mathematics professor Ellen Hayes of Wellesley College, Massachusetts,¹³⁴ via the letters-to-the-editor pages of *Science*. The correspondence concerned a passage from the recently published work by Irish astronomer Sir Robert Ball, *The Cause of an Ice Age*.¹³⁵ Porter wrote on behalf of a group of readers who found "the higher mathematics rather slippery

ground to walk on without help;”¹³⁶ some illumination cast on the subject by Ellen Hayes in her note in *Science* was therefore much appreciated.¹³⁷

In his speculations concerning possible causes of an ice age, Ball considered the effect of a temporary change in the Earth’s orbit around the Sun, an event now thought to be unlikely. Ball asserted that the Earth is “on the whole, rather nearer the sun” if the minor axis of its orbit’s ellipse is decreased. While not questioning Ball’s basic proposition of a temporary orbit change, Hayes subjected to quantitative calculation the change in the average (mean) distance of the Earth from the Sun over the course of a year that would be caused by such an orbit change and therefore how the amount of the Sun’s heat received by the Earth over the course of that year would change. Alice Porter’s specific difficulty was her reluctance to accept Hayes’s preferred method of calculation.¹³⁸ As an alternative she proposed a simpler, geometric construction that gives the radius of the circle having the same area as the ellipse while avoiding the use of the integration over time. This simpler method ignored both the fact that the Sun is at a focus rather than the center of the ellipse and the importance of expressing all variables concerning the orbit as functions of time; Hayes clarified these points in a reply.¹³⁹

Alice Porter’s second letter to *Science* reported a spectacular sky phenomenon, a semicircular luminous arch of whitish light, stretching across the sky from west to east, seen from Yarmouth on 9 May 1893. Although auroral displays had been seen half an hour earlier, and the arch may have been connected with these, it had none of the shimmering, wavering character usual with auroras.

UNIVERSITY GRADUATES

The earliest English-language institutions providing college-level education in Canada were those in the Maritime provinces of New Brunswick and Nova Scotia. King’s College, Fredericton (now the University of New Brunswick), and King’s College, Windsor, Nova Scotia, were both founded in the 1780s by loyalists fleeing the American Revolution. Largely in response to the strong bias of these two colleges against the enrollment of non-Anglicans, three more colleges were established in the Maritimes over the course of the next fifty years—Dalhousie College in Halifax, Nova Scotia, Mount Allison College in Sackville, New Brunswick, and Acadia College in Wolfville, Nova Scotia (figure 4.3). Dalhousie, founded in 1818 by Lord Dalhousie, lieutenant governor of Nova Scotia, was in name nonsectarian but was in effect controlled by the Church of Scotland; Mount Allison was established largely to meet the needs of the Wesleyan Methodist community; and Acadia College was started by the Nova Scotia Baptist Education Society.

West of the Maritimes, the earliest colleges included McGill in Montreal, Quebec, the University of Toronto in Toronto, Ontario, and Queen’s College in Kingston, Ontario. Both McGill and the University of Toronto were founded in the 1820s, the latter beginning as the Church of England King’s College; nonsectarian Queen’s College started in 1841. The first of the provincial universities of western Canada, the University of Manitoba, although established in 1877, had its origins in three older colleges, at least two of which dated to the early days of the Red River Settlement. The universities of Alberta and Saskatchewan were founded by the provincial legislatures soon after the latter were created in the first decade of the twentieth century; the Saskatchewan institution, in Saskatoon, started as an agricultural college. In British Columbia, postsecondary education was provided through programs run by McGill University for several years before the establishing of the University of British Columbia, Vancouver, in 1915.¹⁴⁰ Among the earliest established Canadian colleges and universities, the two whose women graduates are most prominent in this survey are McGill and the University of Toronto.

McGill University

Founded in 1821 from a bequest by Scottish immigrant and Montreal merchant James McGill, McGill College had only a faculty of medicine until 1843, when further funding became available for a faculty of arts. As in early nineteenth-century Australia and New Zealand (see above), also countries that were largely frontier societies, money for education was scarce. A system of public secondary schools in

Canada began only in the 1850s; before that and for some time later colleges themselves frequently provided high-school-level education.

In Montreal, the Montreal High School for Boys, a public school, had been established in 1843, but thirty-two years elapsed before a parallel institution was opened for girls, the Montreal High School for Girls. Within two years of its founding in 1875, this girls' school had prepared seven of its students for the provincewide university admission examination, until that year open only to boys; although these young women ranked high in the results list, they were nevertheless refused admission to McGill. In 1884, when candidates from Montreal High School for Girls further demonstrated their capabilities by obtaining the two top scores in the admission examination, a further effort was made to open McGill classes to women. It succeeded, thanks to a very substantial gift to the college from Montreal businessman Donald Smith (Lord Strathcona), offered that year on condition that McGill open an affiliated college for women. Four years later, in 1888, the first class of eight "Donaldas" (named after the donor of the endowment that had made their entry possible) received their B.A. degrees. There was little disagreement about the awarding of degrees to women in McGill's faculty of arts, but some question remained about whether classes should be mixed or coeducational. Another generous gift from Lord Strathcona for the establishment of a residential college for women, to be managed by the McGill corporation, settled the matter. From 1899 women students at McGill were also students of Royal Victoria College, whether resident at the college or not. Some of the instruction for women was provided by the college's (female) academic staff, with students in laboratory courses and more advanced studies taking mixed classes, as before.¹⁴¹

OCTAVIA GRACE RITCHIE,¹⁴² later ENGLAND (1868–1948), one of the first eight women graduates of McGill University, was the youngest daughter of Montreal lawyer Thomas W. Ritchie and his wife, Jessie Torrance, née Fisher. Born in Montreal on 16 January 1868, she attended Montreal High School for Girls, distinguishing herself in her final year by obtaining the highest score of any candidate in the 1884 provincewide university entrance examination. She entered McGill's Women's Department that year and was awarded a B.A. with first-class honors in natural science in 1888. Refused entry to McGill's faculty of medicine, she began her medical studies at Kingston Women's Medical College, a school run by Queen's University, Kingston. Later she transferred to Bishop's College, whose medical faculty was in Montreal, although its parent institution was in Lennoxville, Quebec. Ritchie graduated M.D., C.M. in 1891; hers was the first medical degree awarded to a woman in Quebec. Following further studies in Glasgow, Paris, and Vienna, she was appointed demonstrator in anatomy in Bishop's medical faculty and from 1894 until 1906 was assistant gynecologist at Western Hospital, Montreal. In 1897 she married fellow physician Frank Richardson England; she had one daughter.

After her marriage, although remaining active in hospital work as well as conducting a private practice, Octavia England became increasingly interested in public welfare and women's issues, local, national, and international. Women's suffrage was a particular concern. A life member of the Canadian Red Cross, and a life patron of the National Council of Women of Canada, she served as the provincial vice president of the council and was one of the nine delegates representing Canada at the international meeting of women's councils in Rome in 1914. She also contributed a section to the International Council of Women publication *Health of Nations*, edited by Scottish geologist Maria Ogilvie Gordon.¹⁴³ For several years she was president of both the local branch of the Council of Women and the Montreal Women's Liberal Club. Octavia England died in Montreal on 1 February 1948, shortly after her eightieth birthday.

DONALDA (JANET) MCFEE¹⁴⁴ (b. 1863), the first woman graduate of McGill University to earn a Ph.D., was born on 29 October 1863, probably in Montreal. A classmate of Octavia Ritchie, she entered McGill in 1884, one of the college's first group of women undergraduates. During her third and fourth years she became especially interested in philosophy, which then included psychology, an area that was enjoying great prestige and popularity in B.A. courses;¹⁴⁵ McGill's dynamic and inspiring professor of philosophy John Clark Murray advised her to continue her studies at Cornell University after she received her B.A. degree in 1888.

At Cornell Donalda McFee most likely came under the influence of experimental psychologist Edward Titchener, known for his willingness to accept women nongraduate students. Later she went on to work with the founder of experimental psychology, Wilhelm Wundt, in Leipzig, but since Leipzig

degrees were not yet accessible to women, she moved to the more liberal University of Zurich in 1893. Her doctoral research concerned the idea that any knowledge of the empirical world can be obtained only by direct perception, the theory put forward by the eighteenth-century Irish philosopher Bishop George Berkeley and developed later in both British and German schools.¹⁴⁶ Her degree was awarded by the University of Zurich in 1895.¹⁴⁷ She does not seem to have published further work in philosophy. Donalda McFee lived until at least her midseventies and attended a fiftieth reunion of her undergraduate class in 1938.

One of Canada's most notable early physicians, MAUDE ELIZABETH SEYMOUR ABBOTT¹⁴⁸ (1869–1940) was born on 18 March 1869 in St. Andrews East, Quebec, a small village on the Ottawa River halfway between Montreal and Ottawa. She was the second daughter of French Canadian protestant clergyman Jeremiah Babin and his wife, Frances Elizabeth Seymour, née Abbott.

Maude's family life was marked by an unusual tragedy that happened before her birth. In January 1867 Jeremiah Babin was accused of murdering his disabled sister, who in the custom of the Victorian era was confined to the attic of his home and whose body was discovered in the river at the time of the spring floods. Despite circumstantial evidence and strong local feeling against him, Babin was eventually acquitted. His wife, who supported him throughout, gave birth to a daughter, Alice, shortly before the trial; Maude was born two years later, a few months before her mother died of pulmonary tuberculosis. Meanwhile Jeremiah Babin had gone to the United States, and so his two small daughters were left in the care of their maternal grandmother, Frances Mary Abbott, widow of the Rev. William Abbott, rector of St. Andrews East. The Abbotts were a respected and influential family. Maude's grand-uncle, the Rev. Joseph Abbott, was the father of Sir John Abbott, the first Canadian-born prime minister of Canada and, from 1855 to 1880, dean of McGill College faculty of law. Mrs. Abbott adopted her granddaughters and had their names legally changed to Abbott.

Despite the loss of both parents, Maude and her sister had a pleasant childhood. Alice was musical, while Maude, a shy child, had interests that ranged widely; above all she wanted a good education. Both girls were taught at home by a governess, but Maude spent a final high-school-level year at a private school for young ladies in Montreal run by the Misses Symmers and Smith. That year, for the first time, this school sent a class to the university entrance examination, and although there were deficiencies in her preparatory work, Maude won a scholarship to McGill. Family obligations and a smallpox epidemic in Montreal kept her in St. Andrews East for a further year, but she entered McGill University in 1886 and graduated B.A. in 1890, with the third class of women in the arts faculty. During her undergraduate years she not only won academic distinctions, but participated fully in student affairs; class president and a coeditor of the student newspaper, the McGill *Fortnightly*, she also helped in the formation of the future McGill Alumnae Society, a debating society that also ran a soup kitchen for the needy that ultimately became the University Settlement. In her final year she won the Lord Stanley Gold Medal for general proficiency and was class valedictorian.

Denied admission to McGill medical school, she accepted an invitation to enroll in the faculty of medicine of Bishop's College, also in Montreal, and through that school became entitled to clinical instruction provided by McGill teaching staff in Montreal General Hospital. Hers was one of the few permission tickets issued to female students to attend the hospital clinics; she was the only woman in her year, and soon after she received her ticket, the committee of management passed a resolution that no other hospital attendance tickets be issued to women students. Despite a certain amount of discrimination and strong and unhappy feelings of isolation, she graduated M.D. from Bishop's College in 1894, winning the senior anatomy prize and the Chancellor's Prize for the best examination results in the final-year subjects.

After the death of their grandmother in 1890, Maude and her sister had no close family ties in Montreal, and so, following Maude's graduation, the two young women made an extended visit to Europe. Maude enrolled in postgraduate studies at the University of Zurich for the winter of 1894, her sister meanwhile attending the music conservatorium. In Zurich and during the following two years at the University of Vienna Maude concentrated on gynecology, internal medicine, and pathology, but "it was the grounding I obtained into internal medicine and pathology . . . that determined my bent, and made possible my later work at McGill."¹⁴⁹ On her way back to Canada, Maude spent some months in Britain, getting further hospital experience; she also became LRCPS, Edinburgh (Licentiate of the Royal College of Physicians and Surgeons, Edinburgh).

In Montreal, where she opened a private practice, she at first experienced feelings of great loneliness and isolation from the almost exclusively male medical community. But her prospects brightened immensely when Charles Martin, medical superintendent of the Montreal General Hospital and later dean of McGill's medical faculty, invited her to join a group in the clinical laboratories of the new Royal Victoria Hospital. With Martin she started a statistical study on heart murmurs based on five years of hospital records, and she also joined pathologist and bacteriologist John George Adami for her first pathological research. The presentation of her statistical study to the Montreal Medico-Chirurgical Society in 1899 resulted in her being elected the first woman member of the group; her pathological study, published in the *Journal of Pathology and Bacteriology* in 1901, was the first communication to the London Pathological Society made by a woman (see bibliography).

She was appointed assistant curator of the McGill pathological museum in 1898 and became curator a year later; Adami, as head of the pathology department, was the museum director. Maude's job was to organize, classify, and catalog the large and somewhat chaotic collections of specimens in the neglected museum. Starting with a visit to the Army Medical Museum in Washington, D.C., in 1899 and an enthusiastic and encouraging conversation with former McGill pathologist William Osler, then at Johns Hopkins Hospital, Baltimore, she began what developed into a lifelong undertaking. Her first goal was to establish a classification system adapted from the Dewey decimal library system to meet the needs of pathological collections;¹⁵⁰ in addition she began what she named *The Osler Catalogue* and brought the museum as a teaching tool into the regular medical curriculum.¹⁵¹

Her early interest centered on the rich collection of specimens Osler had contributed to the museum during the eight years he was pathologist at the Montreal General Hospital. The two of them corresponded frequently, and it was Osler who, in 1905, persuaded the McGill governors to institute for her a governors' fellowship in pathology, an appointment she held for five years, until promoted to lecturer in pathology in 1910. That same year she was given an honorary M.D. by McGill.

Impressed by her work at the museum, especially her work with the heart malformation specimens, in 1905 Osler asked her to write a contribution on congenital heart disease for his forthcoming *Modern Medicine*. The monograph presenting analyses of 412 cases that she produced for the first edition (1907) was, in Osler's opinion, "by far and away the very best thing ever written on the subject in English."¹⁵² By the second edition she had increased the number of cases analyzed to 631, and by the third edition her monograph had almost doubled in length, the cases analyzed rising to 850, with many new illustrations.¹⁵³ Starting from the morphological aspect, she became increasingly interested in the functional and clinical; one of her most important contributions was her classification of cases of congenital heart disease into acyanotic and cyanotic subgroups, each with a collection of characteristic anomalies, a very practical subdivision that gained general acceptance within a short time. Canadian medical historian Charles Roland of McMaster University later noted that "It would be difficult to overemphasize the importance of Maude Abbott's work in classifying congenital affections of the heart. Even if the technical achievements of surgery and anesthesia had been possible before her work, surgical therapy would have been impossible or, at least, completely empirical until a rational classification could guide progress and provide logic for therapy."¹⁵⁴

Maude Abbott's second major achievement was the founding, almost single-handedly but with the support of John Adami and William Osler, of the International Association of Medical Museums (later the International Academy of Pathology), with headquarters at McGill; she was also secretary-treasurer of the organization from its first meeting in Washington, D.C., in 1907 and for twenty-eight years editor of its *Bulletin* (later the *Journal of Technical Methods*). In 1911 and again in 1913 she went to Europe to visit with or organize local sections of the association. Additional editing work came to her during the First World War, when she served as acting editor of the *Canadian Medical Association Journal*.

Medical history was another of her special interests. Her historical sketch of the McGill medical faculty and her history of medicine in the province of Quebec were notable contributions, as were her biographical sketch of Florence Nightingale and her illustrated lectures on the history of nursing; the latter were delivered during the period when she held the post of lecturer at the McGill School of Graduate Nurses. Her short account "Women in Medicine" appeared in 1911.¹⁵⁵ Perhaps the greatest of her historical contributions was the 650-page Osler memorial volume she brought out as a special issue of the *Bulletin of the International Association of Medical Museums*. Published in 1926, with a second

edition in 1927, it contained appreciations and reminiscences from friends of Osler in many countries and included a classified and annotated bibliography of his voluminous collection of published works; the preparation took her six years.¹⁵⁶

In 1918 she was appointed acting curator of the Canadian Medical War Museum, whose collection of pathological specimens was cataloged at McGill. The following year the Woman's Medical College of Pennsylvania offered her an appointment as head of their department of pathology. Although unable to consider the offer at that time, when it was renewed in the form of an appointment as chair of pathology and bacteriology at twice the previously offered salary, she accepted on a two-year temporary basis. While in Philadelphia she became licentiate of the state of Pennsylvania and was elected member of several American scientific societies, including the American Association for the Advancement of Science. Her promotion to assistant professor of medical research when she returned to McGill in 1925 may well have been prompted in part by her temporary absence but undoubtedly also reflected the growing international recognition of her heart disease research. Despite her limited promotions and a salary well below that of her male colleagues,¹⁵⁷ Maude Abbott's bonds with McGill were strong; when in 1922 the first five women to receive M.D. degrees graduated, she was immensely proud of her alma mater.

A warm, friendly person with great energy and enthusiasm for her subject, from her early years at McGill she welcomed students to the medical museum. The spontaneous discussions that regularly arose provided the students with a considerable amount of instruction and guidance in pathology; by 1905 the value of these informal gatherings was recognized by the medical faculty, and they became part of the required curriculum.

Her last major work, her *Atlas of Congenital Cardiac Disease*, had its origin in a poster exhibit she prepared for the 1932 centennial celebration of the British Medical Association.¹⁵⁸ This exhibit, which attracted considerable attention, illustrated the systematic expansion of her original observations on one thousand cases into a coherent, ordered picture of the underlying causes of congenital heart disease.¹⁵⁹ The 1936 *Atlas* made the material available in permanent published form; in an introductory note to the 1954 reprint, published after her death, Charles Marple, medical director of the American Heart Association, noted that it was Maude Abbott who "bridge[d] the gap between the old, unsystematic and purely descriptive knowledge of congenital cardiac anomalies and the modern era of precise diagnosis and dramatic surgical correction of these defects. In fact it was her systematic study and classification of these defects which opened the way for the astounding practical developments of the past two decades."¹⁶⁰ Few women of Maude Abbott's pioneering generation of women graduates have won a more enviable eulogy.

In 1936, when age limitations required her to retire, McGill awarded her an honorary LL.D. That year even the McGill Faculty Club opened its doors to her as its first female member; half a century later it named a room after her. Maude Abbott died in Montreal at the age of seventy-one on 2 September 1940 of a cerebral hemorrhage. Her name is commemorated in the Maude Abbott Memorial Scholarship Loan Fund established by the Federation of Medical Women in 1938. She is the only woman and the only Canadian in Diego Rivera's great mural of the history of cardiology in the National Institute of Cardiology in Mexico City.¹⁶¹ Painted in the late 1940s, Rivera's mural showed the fifty most important heart disease investigators in world history, from the Greek physician Galen in the second century AD to the American Paul D. White in the twentieth. Maude Abbott is shown next to Carl von Rokitanski of Vienna, whom she greatly admired for his ground-breaking work on heart defects.¹⁶² At McGill her portrait hangs in the Strathcona Anatomy and Dentistry Building, and in 2000 a bronze heritage memorial plaque was unveiled for permanent placement at the entrance to the McIntyre Medical Building. In 1994 she was posthumously inducted into the Canadian Medical Hall of Fame. Appropriately entitled "Heart of the Matter," a forty-six-cent stamp showing her portrait is part of Canada Post's New Millennium collection.

Maude Abbott's accurate analysis and cataloging of one thousand cases of congenital heart disease was a tremendous undertaking in the days before computers and relatively easy online literature searching; her accomplishment made McGill University a center for heart research. As historian Roland pointed out thirty years after her death, Maude Abbott took a mass of uncoordinated information (publications of hundreds of authors and a huge, disordered specimen collection) and, to borrow the language of the old alchemists, turned this base metal into gold.¹⁶³

Among Maude Abbott's friends and contemporaries at McGill University were two women botanists, Elizabeth Binmore and Carrie Derick. Binmore went on to a career in secondary school teaching and activism in the cause of women teachers; Derick, also a social activist, was to become the first woman instructor on the McGill University faculty.

ELIZABETH BINMORE¹⁶⁴ (1860–1917), the oldest of four children of Thomas Binmore, a bookkeeper, and his American wife, Mary, née Morton, was born in Montreal in 1860. Thomas Binmore, an English immigrant, served as an officer in the Canadian Militia when the cross-border Fenian raids of Irish-American revolutionary groups were taking place in the 1860s.

Elizabeth entered the McGill Normal School in 1875 at the age of fifteen and over the course of the next three years received all three of the school's diplomas, the elementary in 1876, the model in 1877, and the academy in 1878, the latter being a qualification that conferred the right to teach in "superior" schools in the province of Quebec. A second teaching certificate, from a normal school in Pennsylvania, perhaps awarded by examination only, widened her opportunities.¹⁶⁵ She taught for a time in Bradford, a town in northwest Pennsylvania, and then in Protestant schools in Clarenceville, Longueuil, and Montreal before entering McGill University's faculty of arts in 1887, three years after it began to accept women. Since the McGill Normal School's Academy diploma was recognized as equivalent to the first year of the McGill arts course, she graduated with a B.A. in 1890.

Working under the direction of David Penhallow, professor of botany at McGill, Elizabeth Binmore continued her studies, carrying out an anatomical investigation on species of brown algae. Her report entitled "The anatomy of fucaceae," presented to McGill University in 1894, does not appear to have been published, but it earned her an M.A. degree that year, one of the first two awarded to a woman by McGill. By 1892 she had returned to teaching, initially at the Montreal Senior School, where for thirteen years she taught mathematics, and then at the Montreal Commercial and Technical High School, an institution that provided training for the technical and clerical occupations, where she taught science and mathematics in 1906. Over the same period she attended summer courses at Harvard University, including a botany course in 1893 and chemistry courses in 1906 and 1907.

Throughout her career Elizabeth Binmore worked to improve employment conditions for women teachers in Quebec, particularly their salaries, then lower than those paid in any other Canadian province.¹⁶⁶ Energetic and innovative in her own teaching, she sought to reduce rote learning and the habit of automatic reliance on rules. A system of manual training she helped introduce in Quebec about 1885 was one of her special interests. She was active in a number of educational groups, including the Alumnae Society of McGill University, of which she was president in 1897–1898, and the Teachers' Association of Montreal, where she served as president in 1896. Although on the executive of the Provincial Association of Protestant Teachers in 1916, she appears to have greatly reduced or perhaps given up her teaching well before the outbreak of the First World War. She traveled extensively in Europe during these years but did not live to see the end of the war, dying in Montreal on 24 August 1917, when she was about fifty-seven.

CARRIE MATILDA DERICK¹⁶⁷ (1862–1941), teacher, botanist, social activist, and writer on a wide range of topics, is known especially as the first woman to hold a professorship in a Canadian university. Throughout her career she worked with great energy for better educational and professional opportunities for women and championed the cause of women's suffrage.

A daughter of Frederick Derick of United Empire Loyalist (American loyalist) stock and his wife, Edna, née Colton, Carrie was born on 14 January 1862 in Clarenceville, in the area known as the Eastern Townships of Quebec, communities lying between the Richelieu River and a northern bay of Lake Champlain (figure 4.1). She received her early instruction at the Clarenceville Academy, where from the age of fifteen she helped with the teaching. In 1881, after graduating from McGill Normal School, which awarded her the Prince of Wales Gold Medal and their highest certificate, the academy diploma, she returned to Clarenceville Academy as principal; she was then nineteen. Two years later she moved to Montreal, where she taught at Bute House, a private school for girls, until 1887, when she entered McGill University as a second-year student in the faculty of arts. When she graduated B.A. with first-rank honors in natural science in 1890, she was also awarded the Logan Gold Medal.

Over the next six years she divided her time between school teaching and a part-time demonstratorship in botany at McGill (1892–1896), and continued studies under the direction of McGill botanist

David Penhallow. About this time she brought out the earliest of her botanical writings, general notes on the folklore connected with the plants of her home region in eastern Quebec, especially those plants thought to have medicinal properties (see bibliography). She also contributed a series of popular articles on wildflowers to the Montreal newspaper *Family Herald and Weekly Star*, articles that included detailed, illustrated descriptions of many species and did not avoid the use of botanical terms.¹⁶⁸

Throughout the 1890s her summers were spent at either Harvard University or at the Marine Biological Laboratory in Wood's Hole, Massachusetts, where Penhallow had secured at least one table for qualified McGill students. She became a full-time lecturer at McGill in 1896 after receiving an M.A. degree.¹⁶⁹ That summer and the one following she carried out at Wood's Hole a morphological investigation of a species of the Florideae group of red algae (Rhodophyta), following the development of the anchoring organ, the holdfast, from the plant's early stage to maturity; the work was completed in the McGill botanical laboratory with help from David Penhallow and published in a lengthy paper in 1899 (see bibliography). Periods of leave from McGill allowed her to attend the Royal College of Science, London, in the spring and summer of 1898 and Bonn University in Prussia in 1901–1902. At Bonn she studied under the guidance of the pioneering plant cytologist and physiologist Eduard Strasburger, but she does not appear to have published an account of any research she may have carried out there. By the following summer she was once again at the Wood's Hole Marine Biological Laboratory, where she also spent some time in 1912; for a number of years she was a member of the corporation running the laboratory. After her promotion to assistant professor in 1904, her summer study leaves were somewhat curtailed, since she was frequently expected to teach extra summer courses at McGill.

In 1909, when David Penhallow became ill, Carrie Derick undertook much of his work, and when Penhallow died unexpectedly during a transatlantic voyage in 1910, she continued these administrative duties. To her disappointment she was not selected to succeed Penhallow as department head, despite local support; the appointment went instead to American botanist Francis Ernest Lloyd (1868–1947), a well-known specialist in comparative embryology. In compensation Derick received the courtesy title of professor of morphological botany, a change of status that was more honorary than real and one that did not include a rise in salary. The matter caused considerable contention between Derick and the McGill administration. Initial difficulties in her relationship with Lloyd were reduced after a demonstrator to help Lloyd was appointed and she was relieved of the extra work he had assigned to her.

By the time she was established on the botany faculty, Carrie Derick's interests were focusing particularly on the then-controversial topics of heredity and evolution, the early years of the twentieth century being a time when a great deal of intensely interesting work was going on in the emerging field of genetics.¹⁷⁰ The course Derick developed on evolution and genetics was the first of its kind at McGill.

Hers was a forceful and outgoing personality. A good lecturer, she was much in demand as a public speaker and frequently gave wide-ranging talks in botany and biological subjects in general that were aimed at nonscientists. During the First World War she was active in the Red Cross and other relief organizations. For a time in 1920 she held a lectureship in social service. She saw the advantages to women of training in more technical areas and encouraged careers in fields such as agriculture, as well as the more traditional areas. Her studies in heredity and eugenics led her to consideration of topics such as mental deficiency and juvenile delinquency, and she did not refrain from making public her views on questions of special interest to women, including her support for birth control, then illegal in Canada. An ardent feminist, she held office in a number of women's organizations in Montreal. Her article on professions open to Canadian women at the beginning of the twentieth century appeared in 1900. In 1927 she presented her mature reflections on the advances made by the pioneer women of the 1880s, their expectations, and their views for the future.¹⁷¹ She held memberships in several educational organizations, including the Federation of University Women of Canada, and she was a fellow of the American Association for the Advancement of Science.

Carrie Derick's last two botanical publications were a short general article on the species of trees on the McGill campus, with notes on their history, brought out in 1929, and a determination and description of species in the two distinct plant communities of the "Burn-out" district of southern Saskatchewan, a narrow stretch of territory just west of Regina running southeast to the United States border. The Saskatchewan collections she examined were made by McGill geologist John Stansfield in the

summer of 1918; Derick's account formed part of his report on the two soil types of the region and his opinion on prospects for future successful farming there.¹⁷²

After almost four decades on the teaching staff, Carrie Derick retired from McGill in 1929, her health by then beginning to fail. At that time the university made her professor emeritus of comparative morphology and genetics, her title of professor of morphology having been modified in 1928 to reflect her interest in genetics. She was the first woman on the McGill staff to be granted emeritus status. She died in Montreal on 10 November 1941, two months before her eightieth birthday, after a long period of confinement in the Royal Victoria Hospital, Montreal. Her sister, Louise Derick of Montreal, survived her. An award open to McGill faculty members, the Carrie M. Derick Award for Excellence in Graduate Supervision and Teaching, commemorates her name. There is also a Carrie M. Derick prize for undergraduates.

Plant pathologist MARGARET NEWTON¹⁷³ (1887–1971) began her career two decades later than Carrie Derick and Elizabeth Binmore, both members of the first group of women students at McGill University, but a short account of Newton's life and work is included here because she too was a pioneer; in 1918 McGill University's Macdonald College awarded her the first degree in agriculture earned by a Canadian woman.

Margaret Newton was born on 20 April 1887 in Montreal, the oldest of the five children of John Newton and his wife, Elizabeth, née Brown. An immigrant from England with an education in chemistry, John Newton was then working on his father-in-law's farm in the region just north of the Ottawa River between Montreal and Ottawa. Margaret's earliest years were spent in the small rural community of Plaisance, Quebec, a circumstance that undoubtedly influenced her later career choice. Her first instruction was in a one-room school in the nearby village of North Nation Mills, but a few years later the family moved to Montreal, John Newton having taken a higher-paying job there with a lumber firm. Before Margaret finished high school, the Newtons returned to Plaisance, where she completed her secondary education and taught for a time in a country school at Sainte-Amadée, although she lacked formal teaching qualifications. To complete teacher training she then studied for two years at the Collegiate Institute in Vankleek Hill, Ontario, not far from Plaisance, and obtained the full qualification of the Ontario Normal School, at that time located in Toronto. During her subsequent four years of teaching, first in the Montreal suburb of Lachine and then in her old school in North Nation Mills, the idea of having a university degree became more and more attractive. Having saved enough money, she enrolled initially in the arts program at McMaster University (then in Toronto), but she changed her plans after visiting her brother at Macdonald College, McGill's agricultural faculty in Sainte-Anne-de-Bellevue, Quebec.

About 1915, by then in her late twenties with several years of school-teaching experience behind her, she was admitted, after a period of some hesitation on the part of the faculty, to Macdonald College as a student of agriculture.¹⁷⁴ Although somewhat handicapped by rules restricting evening laboratory use by women students, she did well in her studies and was prominent in several student organizations; at the end of her second year she won the only medal given to agriculture students, the Governor General's Bronze Medal for the highest academic standing in her class. That year (1916–1917) she became interested in the problem of cereal rusts then being investigated by one of her professors, mycologist William Pollock Fraser (1867–1943). In March 1916 she attended a talk on rust disease of white pine trees given at a meeting of the Quebec Society for the Protection of Plants, and she joined the society as its first woman member. During the summer of 1917, when Fraser went to western Canada to investigate wheat stem rust that had swept through the wheat fields of Manitoba and Saskatchewan in 1916, Margaret Newton maintained his fungal collection. Following Fraser's instructions, she also made single-spore cultures of fungus samples he sent her and used these cultures in tests with a selection of wheat varieties.

While this work was going on, Dr. Charles Saunders, dominion cerealist at the Canadian government's Central Experimental Farm in Ottawa, visited Margaret at Macdonald College. A few years previously, Saunders, a University of Toronto graduate who had taken a Ph.D. at Johns Hopkins University, had developed the wheat cultivar Marquis, the first modern spring wheat bred in North America with high-quality bread-making characteristics.¹⁷⁵ Saunders gave Margaret a head of his new

Marquis wheat, and out of curiosity she planted several grains and inoculated the resulting plants with wheat stem rust spores. Her results were surprising; some of the inoculated leaves did not display the normal rust reaction, and two repetitions of the tests gave the same results. Although at first puzzled, by early 1918 both William Fraser and Margaret Newton were convinced that the rust fungus, *Puccinia graminis*, must be composed of two or more pathogenic strains or races, a revolutionary discovery in the struggle for control of grain rust. It is all the more remarkable in that the discovery was made by an undergraduate working virtually alone at Macdonald College. When Fraser communicated the news to the dean of agriculture at the University of Minnesota, he was told that Elvin Charles Stakman of the University of Minnesota had made a similar discovery at almost the same time, but he was much impressed, and he asked Fraser to encourage Margaret Newton to come to the University of Minnesota for graduate studies.¹⁷⁶

Margaret received her B.S.A. in 1918, her classmate Pearl Stanford graduating in horticulture at the same time.¹⁷⁷ She continued her rust disease studies in the summer of 1918 at the University of Manitoba, Winnipeg, as assistant to Fraser, and then returned to Macdonald College, which awarded her an M.Sc. degree in 1919 on presentation of a thesis entitled “The resistance of wheat varieties to *Puccinia graminis*.”

About this time her work came to the attention of Walter Thompson (1889–1970), head of the biology department at the very much agriculture-oriented University of Saskatchewan, Saskatoon. In his wheat-breeding research, Thompson had determined that one of his new varieties was resistant to rusts at one location and susceptible at another. When his results were seen to be explicable in terms of different strains of stem rust being present at the two locations, he invited Margaret Newton to continue her work on rust strain variability in his laboratory. Since her preference was to accept the invitation from the University of Minnesota’s dean of agriculture to carry out doctoral research on wheat rusts with Elvin Stakman, an arrangement was reached between Stakman and Thompson whereby she would spend six months of the year in Saskatoon and six months in St. Paul while enrolled in the Ph.D. program; a grant from a division of Canada’s National Research Council provided her with the much-needed funding.

She went to Saskatoon in 1920 as assistant plant pathologist at the Dominion Laboratory of Plant Pathology on the University of Saskatchewan campus, where from 1919 Canada’s most intensive research on physiological specialization of wheat stem rust was being done. Supplied by Stakman with the wheat varieties and cultivars used to differentiate strains of *P. graminis*, she carried out two years of research, her investigations covering the distribution of fourteen races of wheat stem rust found in both western Canada and the United States and the host range for these races on twenty-nine species of grasses. In addition she carried out a histological study of the stem rust infection process on resistant and susceptible wheat hosts. Her Ph.D. in plant pathology awarded by the University of Minnesota in 1922 was the first doctorate in agricultural science earned by a Canadian woman.¹⁷⁸

The major stem rust epidemics on wheat that recurred in western Canada in 1919 and 1921 ensured that government funding for cereal rust research in Canada would continue to be provided for some time. As assistant professor in the department of biology at the University of Saskatchewan, Margaret Newton continued her close collaboration on wheat rust research with Walter Thompson and William Fraser, Fraser having moved to a position in Saskatchewan a few years earlier. In 1925 the greater part of the work on physiologic specialization of wheat stem rust was transferred from Saskatchewan to the newly completed Dominion Rust Research Laboratory at the University of Manitoba, Winnipeg. Margaret Newton, by then the most highly trained grain rust specialist in Canada, was offered a position there as senior plant pathologist by the federal minister of agriculture, her charge being the investigation of specialization characteristics in grain rust. Although reluctant to leave her successful research partnership with Fraser and Thompson, the fact that teaching was taking up more and more of her time and that she was assured of a research assistant of her choice at the new laboratory drew her to Winnipeg. One of her most outstanding former students, Thorvaldur Johnson (1898–1988), whom she hired as her assistant, worked with her for the next two decades, coauthoring many of the most important of her forty-two research papers and abstracts. By 1929, the year she joined the Canadian Phytopathological Society as a charter member, her work was attracting attention internationally.

One of the most important studies Newton and her assistants undertook was her investigation of hybridization of wheat stem rust races, a series of studies that led eventually to the demonstration that rust characteristics, such as pathogenicity and spore color, were governed by genetic factors. The work attracted much attention among botanists and plant pathologists, since it was one of the first demonstrations that Mendelian laws of inheritance apply to organisms as low on the evolutionary scale as fungi.¹⁷⁹

Other notable work she carried out that was of special interest to botanists and geneticists was her demonstration that in some crosses between physiologic races of stem rust, the cytoplasm (the non-nuclear part of the cell) of the race used as the maternal parent contained factors that influenced the pathogenicity of the hybrid rust race. As one of the few examples then available of maternal or cytoplasmic inheritance among fungi, this work attracted considerable attention when it was presented at a 1946 quantitative biology symposium at Cold Spring Harbor, Long Island, New York.

In addition to her work on stem rusts, she studied stripe rust of wheat caused by *Puccinia striiformis* and leaf rust of wheat caused by *Puccinia triticina*, as well as powdery mildew of grain and grasses. She also spent some time investigating the nature of rust resistance, especially the type known as adult plant resistance.

Her work being widely known outside Canada, many foreign scientists visited the Dominion Rust Laboratory, among them the outstanding Soviet botanist and geneticist Nikolai Vavilov, a specialist on wheat and other cereal crops;¹⁸⁰ Vavilov invited Margaret to join his group at the All-Union Institute of Agricultural Science in Leningrad, of which he was director. She did not accept this invitation, which included the promise of a salary equivalent of ten thousand dollars, a huge amount for a Canadian scientist at the time, but she spent three months in the Soviet Union in 1933; on that visit she discussed the methods for isolating, inoculating, and identifying physiologic races of wheat rust fungi used in the Winnipeg laboratory.

A careful observer with drive, persistence, and the ability to collaborate, Margaret Newton had the capacity for intense application. She often had several projects under way at the same time and sometimes wanted to publish communications before final results were obtained. Her colleague of many years, Thorvaldur Johnson, who later became director of the Winnipeg Research Station, was, somewhat in contrast, a very cautious investigator. This difference in outlook had little effect on their friendship and collaboration and may well have given their published work an enhanced balance. Aside from the importance of their contributions to basic scientific knowledge of the physiologic races of the cereal rusts, the immediate practical value of the work of Newton and her colleagues should not be overlooked. Successful breeding of rust-resistant wheats for western Canada, an urgent need, could not have proceeded effectively without the rust distribution and characteristics information collected during the annual surveys over widely separated locations that was part of their work.

Margaret Newton's twenty-seven years of steady contact with rust spores eventually led to respiratory difficulties and allergies that caused her to retire in 1945 at the age of fifty-eight and move to the milder climate of Victoria, Vancouver Island. The initial hesitation of the Canadian government to grant her a full pension because of this somewhat early retirement was put aside when the saving her work had brought to Canada was pointed out; she was granted a full pension. Several honors came to her in the later part her career and during retirement. A member of the Agricultural Institute of Canada and the American Phytopathological Society, in 1942 she became the second woman elected to the Royal Society of Canada; six years later she received the society's Flavelle Medal, in recognition of the body of information on rust studies she had built up, work "unparalleled in the literature of plant pathology."¹⁸¹ In 1956 she received a University of Minnesota Outstanding Achievement Award, and in 1969 the University of Saskatchewan gave her an honorary LL.D. She remained active throughout her retirement; gardening, canoeing, and especially natural history interests were among her hobbies. A friendly, mild-mannered, generous person, she joined various social organizations in Victoria and traveled fairly widely. She attended the International Botanical Congress in Sweden in 1950 and had the honor of being presented to King Gustav VII; later that year she went as a Canadian representative to the conference of the International Federation of University Women in Basel. Margaret Newton died in Victoria on 6 April 1971, two weeks before her eighty-fourth birthday, following a brief illness. In 1991 she was elected to the Science Hall of Fame in Ottawa.¹⁸²

HARRIET BROOKS,¹⁸³ later PITCHER (1876–1933), another of McGill University's notable early women students, is now widely recognized as the first woman in Canada to carry out notable research in physics. Her brief career at some of the centers where the opening stages of the investigation of atomic structure were taking place has been well documented since the early 1990s.

The second of eight children of George Brooks, a commercial traveler for a flour company, and his wife, Elizabeth, née Worden, Harriet was born on 2 July 1876 in the small market community of Exeter in southwestern Ontario, about twenty-five miles north of London. During her childhood the family moved around Ontario and Quebec, but she received her final years of secondary instruction at Seaforth Collegiate Institute, a public high school in the town of Seaforth, a few miles north of Exeter; from there she entered McGill University in 1894, at the age of eighteen. Women students having by then been accepted into McGill's arts faculty for ten years, Harriet escaped the difficulties faced by the first pioneers. Like many of the early women students, she chose the science program rather than classics, which required a knowledge of Greek. Her family could give her little help financially, but she won prizes and scholarships every year, thanks to first-rank standings in general as well as honors courses; physics, mathematics, and German were subjects she excelled in particularly. She was also elected class president. In 1898 she received a B.A. degree with honors in mathematics and natural philosophy and the Anne Molson Gold Medal for an outstanding performance in these fields.¹⁸⁴ At the same time she was awarded a teaching diploma, having fulfilled the requirements of the McGill Normal School, as did many of the other women McGill graduates of Harriet's generation.

Natural philosophy students who graduated from McGill University in 1898 had an unusual opportunity open to them: that was the year the physics department was joined by Ernest Rutherford (later Lord Rutherford), an energetic, prominent young scientist then at the start of his career in the new field of nuclear physics. Rutherford was an inspiring teacher, very kind and encouraging to the many students he trained, outstandingly generous in sharing his ideas with them, and possessed of a remarkable ability to plan research and give each worker a task suited to his ability. Further, he was very supportive of women in science.¹⁸⁵ Harriet Brooks became one of the first members of his group. Her initial research, in the area of electricity and magnetism, resulted in her 1899 paper in the Royal Society of Canada's *Transactions* (see bibliography) and in the award of an M.A. degree.¹⁸⁶ In 1899 she was appointed nonresident tutor, a position roughly equivalent to lecturer, at newly opened Royal Victoria College, the women's college of McGill University. Her research with Rutherford continued, with a move to studies in radioactivity.

Along with English chemist Frederick Soddy, a demonstrator in McGill's chemistry department, Rutherford was then studying the gaseous emanation (the radioactive gas) emitted from radium; he and Soddy demonstrated that it underwent condensation when cooled to liquid air temperature.¹⁸⁷ Now known as radon, it was in fact the heaviest gas known, the last member of the noble gas group discovered by Sir William Ramsay. In further studies of the emanations from both radium and actinium, Harriet Brooks observed that the decay of "active deposits" from the emanation formed on surfaces it came into contact with depended on the time of exposure to the respective emanations. Her decay curve determinations for very short exposures showed that the emanations diffused like a heavy gas.¹⁸⁸

In 1901 she was granted leave from Royal Victoria College to take a graduate teaching fellowship at Bryn Mawr College, Pennsylvania, while working toward a Ph.D. degree. A year later Bryn Mawr awarded her a President's European Fellowship, with the suggestion that she use it at Cambridge. With Rutherford's help, her position at Royal Victoria College was kept open for another year, and arrangements were made for her to enroll at Newnham College, Cambridge, and work at the Cavendish Laboratory under the guidance of J. J. Thomson. She was able to continue work on aspects of radioactive decay, particularly a study of the half-life of radon, but Thomson, preoccupied with his research on the nature of cathode rays and the laboratory's continuing work to establish electrical standards, was somewhat pressed for time when it came to helping students in other areas. Further, Harriet declined to take part in the normal, sometimes quite-heated kind of intellectual discussion that took place at the Cavendish Laboratory. Lacking confidence in her ability to make progress in her research, she decided that her situation at McGill was preferable to that at either Cambridge or Bryn Mawr. She returned to Montreal in 1903, resumed her position as tutor in mathematics and physics at Royal Victoria College, and rejoined Rutherford's research group.

Her doubts about her own abilities notwithstanding, her work at Cambridge and then at McGill in 1903 and 1904 resulted in two notable papers. One of these was a brief note to *Nature* in 1904 in which she directed attention to a peculiar type of volatility shown by the “active deposit” of radium after its removal from the emanation.¹⁸⁹ From her investigations of this volatility and his own, Rutherford concluded that radon forms three successive disintegration products, which he labeled radium A, radium B, and radium C, and which were later found and separated. Within a few years it became clear that the effect Harriet had observed was due to a recoil reaction in radium B from the active deposit expulsion of an α -particle (alpha particle) from radium A.¹⁹⁰ While working with Rutherford, Harriet also carried out further studies on thorium, radium, and actinium. In addition Rutherford and she showed that uranium gives off β -rays (beta rays) as well as α -particles during its decay, and they demonstrated that β -rays are negatively charged particles having the same properties irrespective of their sources. Her results were published in a lengthy paper in 1904.¹⁹¹

That same year she accepted a position as tutor in physics at Barnard College, New York City, a women’s college linked to Columbia University. Why she left research at that stage is unclear. At Barnard her work seems to have gone well until 1906, when she informed the college’s dean, Laura Gill, that she intended to marry Bergen Davis, a physics professor at Columbia University whom she had met at the Cavendish Laboratory. The response was unequivocal. If she married she would have to resign from her teaching post; Barnard College did not employ married women lecturers. A plea made by Margaret Maltby, the much-respected head of Barnard’s physics department, was unavailing, as was a spirited defense of women’s right to teach after marriage made by Brooks herself; there were to be no exceptions to the rule.¹⁹² Although the engagement to marry was broken off and Brooks initially agreed to continue at Barnard College, she then resigned.

She spent the summer of 1906 in the Adirondack Mountains, New York, with her friends John and Prestonia Martin. Prominent Fabian socialists, the Martins had property and summer cottages in the region of Keene, where they ran a summer retreat for teachers, writers, and others. Among their guests that year was Maxim Gorky (then writing his novel *Mother*), his secretary Nikolai Burenin, and his companion Maria Andreyeva, with whom Harriet became close friends. In the autumn she traveled with Gorky and his entourage to Italy and stayed for a time with them on the island of Capri. From there she appears to have made contact with Marie Curie. She spent some time in 1906–1907 as a *travailleuse libre* in the Curie laboratory at the Sorbonne, where Marie Curie about then succeeded to the professorship in the department of physics following the death of her husband. Brooks did not publish any of the work she did there, but later papers by the laboratory director, chemist André Debierne, on the decay of radium and actinium cited her contributions, including work done in the Paris laboratory; an article on α -rays from radioactive substances by Lucie Blanquies, who studied under Marie Curie, also mentions work by Harriet Brooks.¹⁹³

In the spring of 1907 Rutherford was preparing to move to the University of Manchester, and Harriet Brooks hoped to join him there rather than accept Marie Curie’s invitation to stay for another year at the Sorbonne. Rutherford wrote a strong letter of recommendation to Arthur Schuster, professor of physics at Manchester, suggesting that Harriet be awarded the university’s John Harling Fellowship. However, while waiting in London for news about the fellowship, Brooks decided to end her career in physics research and marry Frank Henry Pitcher, whom she had known as a demonstrator when she was a student at McGill. Following their marriage in London on 13 July 1907, a few days after Harriet’s thirty-first birthday, they returned to Montreal.

Although her withdrawal from scientific research and academic life was complete after 1907, she remained active in a number of organizations, including the Scholarship Committee of the Canadian Federation of University Women and the Women’s Canadian Club, of which she was the honorary secretary in 1909–1910 and 1911–1912 and president in 1923–1924. In 1910 she gave a lecture on Marie Curie to the McGill Alumnae Society. Of her three children, one son, Charles Roger, died of meningitis at age ten, and her daughter Barbara Anne drowned when she was eighteen in 1928; only the younger son, Paul Brooks, lived to adulthood. She died in Montreal on 17 April 1933 at the age of fifty-six, after a period of lingering illness, perhaps the long-term consequence of radiation exposure.

Harriet Brooks’s research contributions, made over the course of little more than four years at three different laboratories, have been described as being “among the foundation blocks of nuclear

science.”¹⁹⁴ A careful observer with good technique, she had a sound grasp of the theory, to the extent that it had then evolved, behind the complex processes she was studying. To well-thought-out direction she responded with acuity and discernment. However, she does appear to have felt rather strongly the need for direction, particularly the kindly guidance that Rutherford was willing to provide.¹⁹⁵ Although recognized as a good lecturer and a very competent laboratory worker, she did not have the academic career ambition of Carrie Derick or the sustained drive of Maude Abbott or Margaret Newton. Thus it is only relatively recently, after the history of women’s contributions to science became a subject of more widespread interest, that Harriet Brooks has been definitively rescued from obscurity and the story of her brief career in nuclear physics brought to light.¹⁹⁶

University of Toronto

The University of Toronto was established by royal charter in 1827 as King’s College, largely due to the efforts of John Strachan, the Anglican bishop of Toronto, the college’s first president. In 1850 its name was officially changed to the University of Toronto and it became, nominally at least, a secular institution, with most of the King’s College faculty filling the teaching positions. Further reorganization in 1853 created University College as the nondenominational teaching branch, a change that resulted in Bishop Strachan’s leaving the presidency to open Trinity College, a private, Anglican institution. The University of Toronto itself became an examining body, effectively controlled by the Ontario government, with appointments and significant expenditures requiring government approval. From about 50 full-time plus many more occasional students in the 1850s, enrollments at University College increased to about 250 full-time students by the time of Canadian Confederation (1867), most coming from towns and villages in Ontario. Over the following decades there was gradual expansion, and additional faculties were established, despite constant discord and at times bitter controversy between University College presidents and the Ontario legislature. By the late nineteenth century several denominational colleges, largely driven by financial difficulties, federated with the University of Toronto, one of these being Wesleyan Methodist Victoria University, Cobourg, Ontario, an important institution in the early education of women in Ontario.¹⁹⁷

Despite the fact that the University of Toronto’s charter had said nothing that would prohibit the admission of women, efforts by a few women to gain entry to courses at University College from about 1869 met with complete resistance from John McCaul, president of the college until his retirement in 1880. A few women attended classes as special cases throughout the 1870s, and from 1879 were even winning scholarship competitions, although they were not eligible for any of the money awards until 1880. Only one graduated, and University College remained very much an exclusive men’s club. Efforts continued in the early 1880s, most likely led by Emily Stowe, a vigorous advocate of women’s education who was later the first Canadian woman licensed to practice medicine. The Toronto Women’s Literary Club, the predecessor of the Canadian Women’s Suffrage Association, also lobbied energetically for the women’s cause, as did two Ontario grammar schools, St. Catharine’s Collegiate Institute and Hamilton Collegiate Institute, both of which provided education for women beyond the high school level. The admission of women to University College had support in the provincial legislature, as well as among some of the teaching faculty and a number of vocal undergraduate leaders. On the other hand, it was strongly opposed by Daniel Wilson, president of University College from 1880 and of the University of Toronto from 1887 to 1892. Like his friend William Dawson at McGill University, Wilson was in favor of higher education for women, but he believed they should be taught in a separate college affiliated with the university; only if male and female students were physically separated could a high moral tone be maintained.

In 1884 the provincial government took action. By an order in council, women were admitted to lectures at University College. Three women started classes on 6 October 1884, and eight more joined them over the course of that year. Generally they received a cordial welcome from the male undergraduates, but certain restrictions were imposed on them by President Wilson, possibly the most serious being the prohibition against their using the reading room, which then housed the central library catalog. A small office was furnished as a waiting room, and its cupboard converted into a lavatory; a

trustworthy “lady superintendent” watched over the women outside class time, making sure that they did not loiter in halls and at bulletin boards, or stand in front of lecturers’ doors.

By the late 1880s Wilson’s carefully imposed segregation was starting to erode. In the 1891–1892 year, 105 women were registered at University College, nearly one-fifth of all students in the liberal arts program. Severe overcrowding had necessitated that a few tables in the library be reserved for women from 1889, and renovations following a disastrous fire in 1890 included the addition of a women’s common room and their own reading room. Typically the earliest of the women undergraduates studied liberal arts subjects rather than the sciences.¹⁹⁸ Modern languages, in which many won first-class honors, were especially popular, and English and history, subjects that opened more opportunities in posts as high school teachers and administrators, were also favored.¹⁹⁹ Two who had notable careers were Eliza May Balmer and Mary Ellen (Nellie) Spence.

ELIZA MAY BALMER²⁰⁰ (c. 1867–1915), one of the first women to attend classes at the University of Toronto after its official opening to women in October 1884, received her secondary education at St. Catharine’s Collegiate Institute, taking her matriculation examinations and completing her first-year university studies there as well. She appears to have carried out her second-year studies almost entirely on her own, and in the university examinations for that year won the modern languages scholarship and was one of two students ranked for the first general proficiency scholarship.

Now acknowledged as one of the front-line pioneers in opening University College classes to women in 1884, Balmer worked patiently to win the support of sympathetic faculty and government officials. A small, somewhat delicate young woman, she suffered considerably from the hostility she encountered when she first attended classes; even if relatively limited, this had a serious effect on her health for some time, and it may also have contributed to the start of the nervous breakdowns she had in her later years.

After graduating with a B.A. in modern languages and philosophy in 1886, she taught from 1888 until 1891 in the town of Strathroy, about twenty miles west of London, Ontario, and then became one of the first female teachers at Harbord Collegiate Institute, a public secondary school with a strong reputation for academic excellence from its opening in 1892. Along with Nellie Spence, she later became a member of the University of Toronto senate. Eliza Balmer’s death from pellagra in 1915, coming at a time when attention was focused on the war effort, received less notice than it otherwise might have had, given her prominent place in the struggle for women’s acceptance into the University of Toronto.

MARY ELLEN (NELLIE) SPENCE²⁰¹ (1867–1953), the daughter of a clerk, was born in Whitby, Ontario, about twenty-five miles east of Toronto. One of the first three women to attend lectures at the University of Toronto when it opened to women in 1884, she was awarded a B.A. in 1889. For thirty-eight years she taught English and history at Parkdale Collegiate Institute, Toronto, much of the time as head of the department. Her 1897 work *Topical Studies in Canadian History*, based on the material she covered in her history classes, presented outlines of the major events in history in the prescribed syllabus for Ontario schools up to university entrance levels.²⁰²

Nellie Spence was much involved in the 1914–1918 war effort, especially in organizing support for the Parkdale volunteers, several of them her former pupils; one of her school projects was the Parkdale Knitting Brigade, the girls doing the knitting and the boys raising the money to buy the needed supplies. At the end of the war, deeply moved by the loss of so many young men, some of whom were still teenagers, she brought out two biographical memoirs, *The Schoolboy in the War* and *Some Young Immortals*, both now held in Canadian historic microfiche collections. In *The Schoolboy in the War* she recorded her memories of her former pupil Alan Barrie Duncan, a son of the Rev. George Duncan of nearby Port Credit. A lively, mischievous boy, a good athlete, and one of the most prominent and energetic spirits among his fellows, Alan signed up as soon as he was old enough to be accepted, following his older brother George into the Canadian Infantry Corps. Having access to various records and Alan Duncan’s own letters home during his short life overseas, Nellie Spence outlined his story, telling of his mentions in dispatches for outstanding bravery in battle, his promotion to captain at the age of nineteen, his award of the Military Cross in 1918, and his death at the age of twenty on 29 September of that year.²⁰³

In 1937 Nellie Spence received an honorary LL.D. from the University of Toronto in recognition of her historical writings. Both she and her friend and classmate Eliza Balmer were elected to the university senate. She retired from Parkville Collegiate Institute in 1928 and died in 1953 when she was about eighty-six.

Although the women students who entered the University of Toronto in the 1880s concentrated on liberal arts subjects, women students at that time at Victoria College, which affiliated with the University of Toronto in 1890, were being awarded science degrees. Situated in Cobourg, some sixty miles east of Toronto (figure 4.2), Victoria College was founded in 1835 by Wesleyan Methodists as Upper Canada Academy, a secondary institution that advocated the study of modern subjects rather than the traditional classics; it was also one of the first seminaries in the province where women could advance beyond an elementary education and study subjects such as mathematics, the sciences, and modern languages at high school level. When the college was given university status and degree-granting authority in 1841, women were excluded, but provision was made for them at other Methodist institutions with close ties to the college; reintegration came in the early 1870s. The first women to proceed to degrees were Adeline Shenick, who enrolled in 1879, Nellie Greenwood, who followed in 1880, and Clara Field and Carrie Munson, both of whom matriculated in 1881. Victoria College's science department followed a curriculum distinct from that of the liberal arts students. Put in place in 1875, it offered what was undoubtedly a challenging course, designed to prepare those looking toward careers in applied fields, such as architecture, surveying, and mining, while also providing a broad, liberal education. Evidence of the rigor of the course may be deduced from the fact that eight of the eleven students registered in 1880 already had B.A. degrees; it never attracted many students and disappeared in 1892 after Victoria University federated with the University of Toronto.²⁰⁴

Little information has been uncovered about the first women science students at Victoria College, with the exception of Nellie Greenwood.²⁰⁵

NELLIE CORA GREENWOOD,²⁰⁶ later ANDREWS (1864–1958), the daughter of C. S. Greenwood and his wife, Esther, was born on 21 April 1864 in Farmington, western Maine. She acquired her secondary education at Battle High School. When the Greenwood family moved to Ontario about 1880, Nellie, then sixteen, matriculated in the science course at Victoria College; on graduating four years later (1884), she became the first woman in Ontario and the second in Canada and the British Empire to be awarded a B.Sc. degree.

For a number of years she taught mathematics and English at Peterborough Collegiate Institute in the town of Peterborough,²⁰⁷ about twenty-five miles north of Cobourg; in 1887 she married Wilbur William Andrews (1859–1922), who was ordained as a Methodist minister the same year. Andrews went on to study natural science and philosophy at Victoria College, graduating in 1890, after which he became science professor and dean of applied sciences at Mount Allison University, Sackville, New Brunswick.

Moving to New Brunswick did not entirely end Nellie's teaching career; in 1892–1893 she taught mathematics and the following year botany and physiology at Mount Allison Ladies' College. The family, in which there were two children, moved again in 1911, this time to Regina, Saskatchewan, Wilbur Andrews having accepted the position of president of Regina College. Founded that year by the Methodist Church of Canada as a result of the provincial government's 1907 decision to establish the University of Saskatchewan in Saskatoon, the college was initially a small, denominational secondary school, but student numbers gradually increased. By the 1920s Regina College was formally associated with the University of Saskatchewan as a junior college offering accredited university courses; it is now the University of Regina.²⁰⁸

Wilbur Andrews remained the institution's president for only a few years, resigning after disagreements with the board of directors over plans for future development.²⁰⁹ Still in his early fifties, he turned his attention to developing the ideas he had for improving agricultural practices; he became active in a number of farming organizations and served as a member of the Board of Trade, as well as carrying out his own agricultural investigations designed to improve traditional farming methods.

Nellie Andrews immersed herself in social concerns, particularly the women's suffrage movement. As first president of the Saskatchewan Women's Temperance Union from 1912 to 1917, she took part in debates, chaired the first meeting of the Provincial Equal Franchise Board, circulated petitions, and

was spokesperson for the delegation that presented the petition for voting rights for women to the Saskatchewan legislature in 1915. In 1921 she was elected to the Regina Collegiate Board, becoming the first woman in Saskatchewan to hold this kind of position in academic governance matters. She founded and was first president of the Regina University Women's Club and also served in leadership positions in local and provincial councils of women. A widow from 1922, she died in Regina on 19 February 1958, two months before her ninety-fourth birthday.

Although authorized to do so by the university senate in 1882, the University of Toronto did not offer a Ph.D. program until 1897; over the next eight years seven of its departments, including chemistry, geology, philosophy, physics, and physiology, decided to participate. The first two women to be awarded doctorates were chemistry student Clara Benson and philosophy (experimental psychology) student Emma Baker, both of whom received their degrees in 1903.

CLARA CYNTHIA BENSON²¹⁰ (1875–1964) was born on 5 June 1875 in Port Hope, Ontario, on the northern shore of Lake Ontario about sixty miles east of Toronto. She was the elder daughter among the three children of Thomas Moore Benson, judge of the United Counties of Northumberland and Durham, and his second wife, Laura Abigail, née Fuller, second daughter of the Right Rev. Thomas Brock Fuller, the first Anglican bishop of Niagara. She had two half-sisters who survived childhood.

In 1895, after completing her secondary education at Port Hope High School, she matriculated at University College, University of Toronto, where her major subjects were chemistry, physics, and mathematics. The B.A. she received in 1899 was the first with a concentration in chemistry awarded to a woman by the university. She continued her studies as a doctoral student under the guidance of William Lash Miller, an outstanding research scientist and teacher who dominated chemical research activity in Toronto for almost half a century. Her thesis research was part of a series of reaction velocity studies then being carried out by Miller; an investigation of reaction rates in solutions of inorganic salts, it was reported in the *Journal of Physical Chemistry* in 1903.²¹¹ Whether or not specially noted at the time, her successful 1903 doctoral thesis defense is now looked on as an important event in the history of women students at the University of Toronto; its one-hundredth anniversary in 2003 was appropriately celebrated by members of the university's chemistry department. Clara Benson's work under Miller's supervision resulted in three additional reports, all published in the *Journal of Physical Chemistry*;²¹² in the last of these, an investigation of the temperature dependence of the rate of liberation of iodine from potassium iodide in an oxidizing solution, she took the opportunity to thank Miller for his help and noted that this was her last work in his laboratory.

With professional employment opportunities for women with advanced qualifications in chemistry very limited then, as they would be for many years after, Clara accepted a position as demonstrator in food science in the Lillian Massey Normal Training School for Household Science, which three years later became the University of Toronto's faculty of household science, the first in Canada to offer a four-year program in that area.²¹³

Her move into the emerging field of household science, though perhaps made only because she considered it her best available option, meant that she needed to learn some biochemistry and physiological chemistry. In this she was guided by the University of Toronto's department of physiology chairman Archibald Byron Macallum (1858–1934), a Fellow of the Royal Society and a distinguished figure in the development of biochemistry and physiology in Canada. Most of Macallum's research centered on studies of the ionic composition of cells and blood, the kind of analytical work not entirely foreign to Clara Benson after her doctoral work. Over the years she carried out a number of biochemical investigations on concentrations of various ions and compounds in fluids and tissues, at least one a joint project with Macallum.²¹⁴ In 1905, when food science became part of the curriculum in the medical faculty, she was appointed lecturer in Macallum's department of physiological chemistry, which made her the first woman in the university to hold a position above the rank of demonstrator. The following year she became an associate professor of physiological chemistry in the newly established faculty of household science. She and the faculty's director, Annie Laird, were the first two women associate professors at the university.²¹⁵

During the First World War a shortage of technicians in Canadian munitions factories prompted her to organize a course of instruction on how to analyze munitions preparations using techniques she had developed for testing foodstuffs; this contribution to the war effort helped to standardize the different stages of munitions production.

A full professor from 1926, she retired in 1945 at the age of seventy and returned to her hometown of New Hope. Although her research output was modest during her four decades at the University of Toronto, her overall impact on the institution was nevertheless notable. She is perhaps commemorated most of all in the area of women's athletics. As president of the Women's Athletic Association from 1921 until she retired, she led the effort for better facilities, which were finally made available in 1959 when the Clara Benson wing of the University Athletic Center was opened. There is also a Clara Benson Honour Award in women's athletics.

A member of the Canadian Society for Chemistry from 1919, she was also a fellow of the Chemical Institute of Canada, of which the former is a constituent society. The society's Clara Benson Award, first offered about 1990, recognizes an important contribution to chemistry made by a woman working in Canada. Clara was the one woman in the group that in 1906 founded the American Society for Biological Chemistry (later the American Society for Biochemistry and Molecular Biology), and in 1956, by then one of the last surviving charter members, she attended the society's fiftieth anniversary dinner in Atlantic City, New Jersey. Over the years she traveled extensively, visiting countries in Africa, South America, Europe, and the Far East, as well as making frequent visits to the United States to attend scientific meetings. She died in New Hope in March 1964 at the age of eighty-eight.

Available information is somewhat limited on EMMA SOPHIA BAKER²¹⁶ (1856–1943) although she shares with Clara Benson the distinction of being one of the first two women to be awarded a doctoral degree by the University of Toronto.

Emma Baker was born on 27 February 1856 at Milton, Ontario, about twenty-five miles southwest of Toronto. After attending Newmarket High School in the town of Newmarket,²¹⁷ some twenty-five miles north of Toronto, she continued her education at Toronto Normal School and at Alexandra College, the women's department of Albert University, Belleville;²¹⁸ she was awarded a "Mistress of Liberal Arts" degree, probably in the mid or late 1870s. She then taught and served as principal at a succession of high schools for girls in Ontario and Pennsylvania, including the Presbyterian Ladies College of Toronto, where she was lady principal for six years. She also spent two years overseas, one in Paris and the other, in 1896–1897, at Newnham College, Cambridge.

She most likely entered the University of Toronto soon after returning from Cambridge. Concentrating on experimental psychology, she studied under August Kirschman, whose special interest was color theory and its relation to aesthetics.²¹⁹ Her first paper, "On combinations of two colours," in the series "Experiments on the aesthetic of light and colour," appeared in 1900 in *University of Toronto Studies. Psychological Series*; she was awarded a B.A. degree the same year. Then about forty-four, she continued studies with Kirschman at the graduate level and published a second article, "Spectrally pure colours in binary combinations," in 1902; her doctoral dissertation consisted of these two reports.²²⁰ The Ph.D. she received in 1903, the eighth awarded by the University of Toronto and one of the first two to women, was also one of the first two awarded by the philosophy department. A third report in this series of experiments on the aesthetic of light and color, "Combinations of colours and uncoloured lights," was coauthored with undergraduate student Susannah Amelia Chown. Emma Baker also co-authored a 1900 paper with August Kirschman and William James Dobbie entitled "Conceptions and laws in aesthetic."²²¹

In 1901 Emma Baker accepted the position of vice principal, the chief female administrative officer, of Mount Allison Ladies' College. The largest unit of Wesleyan Methodist Mount Allison University in Sackville, New Brunswick, the Ladies' College had that year suffered the unexpected loss of its highly regarded vice principal Mary Mellish Archibald and was in urgent need of an experienced administrative officer. Throughout most of her time at the college, Emma Baker remained in this post and also taught courses in French and biblical history or Bible as well as in psychology; in 1907–1908 she taught psychology only. Perhaps attracted by the prospect of teaching more in her own area of expertise, she resigned from Mount Allison Ladies' College in June 1913 to accept the professorship of psychology, ethics, and economics at Maryland College for Women, Lutherville, Maryland. She clearly had warm feelings toward Mount Allison and made two gifts to the Ladies' College shortly after leaving: one thousand dollars in 1914 to endow a chair in English Bible, and the same amount in 1918 for a similar chair. She remained at Maryland College of Women for sixteen years, for most of that period also serving as the college principal. When she retired at age

seventy-five in about 1930, she returned to Toronto, where she died on 26 October 1943 in her eighty-eighth year.

ELIZABETH REBECCA LAIRD²²² (1874–1969), one of the first women students at the University of Toronto to concentrate on mathematics and physics, received her B.A. in 1896, three years before her counterpart in chemistry, Clara Benson (see above) received hers. The mid-1890s were not propitious times for women with ambitions for graduate studies in the university's physics department, doctoral degrees being introduced only in 1897 and the first Ph.D. in physics being awarded in 1900.

Elizabeth Laird was born on 6 December 1874 at Owen Sound, about one hundred miles northwest of Toronto on Lake Huron's Georgian Bay, the youngest of three daughters among the four children of John Guinnis Laird and his wife, Rebecca, née LaPierre. John Laird (1837–1897), from County Fermanagh, northwest Ireland, was a Methodist minister; the family of Rebecca LaPierre (1837–1892) was from Maus Plains, Ontario. Of the children, only Annie Lewisa and Elizabeth Rebecca lived into the twentieth century; the oldest sister, Carrie Ludmilla, died at the age of twenty-five in 1894, and the son, James Guinnis, in 1900 when he was twenty-one.

The family moved fairly frequently, living in various places throughout Ontario where John Laird had charges. Elizabeth completed her secondary schooling at the London Collegiate Institute and entered University College, University of Toronto, in 1892. Despite her high class standing throughout her undergraduate years and the fact that she won the gold medal in mathematics and physics in her final year, she was not accepted by the university's physics department for graduate study after receiving her B.A. She taught mathematics for a year at Ontario Ladies' College, Whitby, twenty-five miles east of Toronto, and in 1897 started graduate study at Bryn Mawr College, Pennsylvania.

Her first research, carried out in the Bryn Mawr physical laboratory under the direction of A. Stanley MacKenzie, concerned the change in the period of a length of piano wire vibrating in different liquids, the wire being made to vibrate by means of an electric magnet. The results for the lowering of the pitch agreed very well with the values obtained analytically by Sir George Stokes, published in 1848.²²³ Brought out in the *Physical Review* in 1898 (see bibliography), the work won her the Bryn Mawr President's European Fellowship for 1898–1899. She spent the year at the University of Berlin, which at that time did not regularly admit women, but, as she later recalled, "There was no crowding in mathematics and physics and I had no difficulty in getting from different professors permission to attend their lectures."²²⁴ In a letter to her sister Annie she described her meetings and conversations with several other young North American physicists in Berlin in 1898; one of these was Margaret Maltby, then on the staff at Lake Erie College in Ohio, who was on a year's assistantship with Friedrich Kohlrausch at the Physikalisch-Technische Reichsanstalt, Charlottenburg.²²⁵ Elizabeth attended the lectures of a number of well-known scientists, including 1918 Nobel Prize-winner Max Planck, J. H. Van't Hoff, winner in 1901, and Emil Warburg. Her studies on magnetization in iron appeared in *Annalen der Physik* in 1900 (see bibliography). After she returned to Bryn Mawr in 1899, she held a substitute demonstrator position in physics and resumed doctoral research. Working once more under the direction of A. Stanley MacKenzie, she entered a different branch of physics, an investigation of the absorption spectrum of chlorine. She was awarded a Ph.D. (mathematics and physics) in 1901. Later that year she joined the staff of the physics department at Mount Holyoke College, South Hadley, central Massachusetts, and in 1904 was named professor and head of the department, the position she held until her retirement in 1940.

Already interested in the phenomena of electrical discharge, ionization, and X-rays, Elizabeth spent the summer of 1905 in J. J. Thomson's laboratory at Cambridge, returning again in the spring of 1909. Subsequently she was able to maintain a slow but steady program of research activity using summers and sabbatical leaves at other institutions and also carrying out a certain amount of investigation in her own laboratory at Mount Holyoke. A Sarah Berliner Fellowship²²⁶ enabled her to spend the year 1913–1914 at the University of Würzburg studying discharge radiation in the laboratory of Wilhelm Wien, winner of the 1911 Nobel Prize for his work on black body radiation. Five years later she had a semester at the University of Chicago in Robert Millikan's group and in 1925 was an honorary research fellow for a semester in the Sloane Laboratory, Yale, where she collaborated in studies of reflection of soft X-rays with Joseph Henderson, later chairman of the department of physics, University of Washington, Seattle.

As reflected in her publications list covering the period up to about 1930, her major research interest throughout these years was cathode rays and X-rays; during the 1930s she carried out investigations with Mount Holyoke undergraduate students on the Raman effect, a phenomenon discovered only in 1928. She retired from Mount Holyoke as professor emerita in 1940, when she was about sixty-six, and returned to London, Ontario.²²⁷

By then the Second World War had begun in Europe, and radar development became an urgent issue for allies of Britain. The University of Western Ontario, London, was selected by Canada's National Research Council as one of three or four Canadian universities to join in an intensive, secret research program. The foundation for the work at Western lay in the experimental radio station started by the university's physics department in the 1930s; part of the institution's extension program, it was intended to measure variation in the height of the ionosphere by a statistical study of reports from listeners.²²⁸ By January 1940 course offerings had been expanded to include radio and vacuum tube theory and practice; training programs for military radio technicians were added soon after. Within a few months the department changed itself into a laboratory for radiation studies and the detection of centimeter-wavelength waves. The challenge and urgency of the task and the close-knit character of the group made it an especially dynamic, exciting, and pleasant place in which to work.

Initial research focused on antenna radiation patterns; transmissions from the science building were monitored in a cold, unheated, shed via a variety of antennas mounted on the shed's roof. Trained workers being in short supply, Elizabeth Laird changed her retirement plans and that winter (1940) went to the physics department and asked if she could be of any help. Her offer was quickly accepted. She became part of the radar research team, working without remuneration and taking her turn making measurements in the unheated shed. In 1945 her position in the department was made formal, with an appointment as honorary professor. She continued an active research program until her second retirement in 1953, at the age of seventy-eight, although she participated in departmental colloquia and other scientific gatherings until shortly before her death. During the late 1940s and early '50s she supervised the work of several M.Sc. students, their studies focusing on the effects of microwave radiation on biological materials such as egg albumin, horn keratin, and casein.²²⁹ She also consulted for the Ontario Research Foundation (now ORTECH International) on the medical uses of shortwave radiation.

Elizabeth Laird was a fellow of the American Physical Society and held memberships in the Canadian Association of Physicists, the History of Science Society, the American Institute of Radio Engineers, the Association of Physics Teachers, the Optical Society of America, and the American Association for the Advancement of Science. Her colleague at the University of Western Ontario, physicist A. Donald Misener, described her as "the rare combination of a conscientious and productive research worker and an inspiring and able teacher."²³⁰ She was awarded an honorary D.Sc. by the University of Toronto in 1927, and in 1945 the University of Western Ontario gave her an honorary LL.D. Her long career in physics, spanning more than half a century from the preatomic age until well after the dropping on Hiroshima of the first atomic bomb, was in many ways remarkable for a woman of her time. Among her advisers and teachers were several of the pioneering physicists of the early twentieth century. Her forty years as head of the physics department of a small women's college in central Massachusetts was fairly conventional, but her steady, active interest and creditable, if slow, output of solid research over the period remains notable. Even more notable is her reentry into fast-paced research in her late sixties and her ready acceptance as a valued team member by a much younger, hardworking group of men carrying out critical wartime research. Hers was a career that could be looked back on with satisfaction. She died on 3 March 1969, having outlived all three of her siblings by many years.

Her gift of funds to the University of Toronto supports the Annie L. Laird Fellowship in memory of her sister Annie (1871–1939), the first director of the university's faculty of household science. The fellowship of about \$3,200 is offered in alternate years to a University of Toronto graduate undertaking graduate study in nutrition. In 1970 the University of Western Ontario established the annual Elizabeth Laird Memorial Lecture.

ALICE EVELYN WILSON²³¹ (1881–1964) began her work in paleontology only in 1909. Nevertheless, since she was the pioneer of women's entry into the profession of geology in Canada, a brief sketch of her career is included here.

Born in Cobourg, Ontario, on 26 August 1881, she was the only daughter in the family of four children of pharmacist Richard Wilson and his wife, Mary Adelia, née Kingston. Both her older brothers became well known in their fields. Alfred, the elder, was a geologist who spent most of his working life at the Mines Branch of the Geological Survey of Canada, Ottawa, and Norman, the second brother, became head of the University of Manitoba mathematics department. A third brother, younger than Alice, did not live to adulthood. Two of her relatives held faculty positions at Victoria University, which was in Cobourg until 1892, when it moved to Toronto. On one side of the family was John Wilson, professor of classics, and on the other was William Kingston, her maternal grandfather, professor of mathematics and amateur geologist, who gave Alice her introduction to the earth sciences. This strongly intellectual bent was combined in Alice with a love of the outdoors. Although not very robust as a child, she joined in the camping trips of her father and brothers, exploring the countryside and the shore of Lake Ontario near Cobourg, developing the curiosity and enthusiasm about rock formations and fossils that lasted all her life.

She attended Cobourg Collegiate, passed university entrance examinations with honors in classics, and entered Victoria College, University of Toronto, in 1901. Intending to become a teacher, she studied history and modern languages but also listened to lectures in various science courses. She did not then complete her B.A. requirements but left the university in her third year, 1904, perhaps because of health difficulties caused by the chronic anemia from which she suffered all her life. The death of her father that year would have added to her stress.

Recovery was slow, but about three years later she returned to the University of Toronto, not as an undergraduate but as an assistant in the mineralogy department, where she spent two years looking after specimens in the department's Victoria Memorial Museum. In 1909 she joined the staff of the paleontology division of the Geological Survey of Canada (a branch of the federal Department of Mines founded to help the development of Canada's mineral resources). At first her duties were mainly clerical, labeling, cataloging, and generally caring for the fossils that had been accumulating for the previous seventy years. Encouraged by survey paleontologist Percy Raymond, she completed her degree requirements at the University of Toronto in 1910–1911 and was awarded a B.A., honors history and modern languages, in 1911. Also that year she was given tenure at the survey, becoming one of the permanent technical staff, with the title of assistant paleontologist, even though her salary remained that of a clerical worker for some time.

Her museum duties were never light, but gradually, with Percy Raymond's encouragement and guidance, she began her studies of the rocks of the Ottawa–St. Lawrence Valley districts that could be reached by short field trips. Part of a relatively unexplored area of several thousand square miles, the region was of special interest because of its rich deposits of Ordovician fossils laid down during a number of successive invasions by the sea over a period of 400 million years; her work was likely to yield valuable results. Her first paper, a description of a new species of Ordovician mollusk of the Pelecypoda class from a museum specimen, was published in 1915; she proposed the species name *Rhytimya granulosa*.²³² That summer she spent a six-week study leave at the Marine Biological Laboratory, Cold Spring Harbor, Long Island, where she increased her knowledge of the comparative anatomy of simple marine organisms. Soon after, wishing to further her formal training and better her chances of advancement in the survey, she applied for one of the paid leaves being offered by the survey to its promising young geologists for doctoral study. She was then about thirty-five. Her application and several later reapplications were turned down, largely, it would seem, because the survey was reluctant to open to women the opportunity to take part in the kind of work, such as long and arduous field trips, that a fully qualified geologist would expect to undertake.

Meanwhile her studies of the Ottawa Valley continued, although museum work took most of her time. When in 1916 fire destroyed part of the Parliament building, and the government requisitioned the survey's Victoria Memorial Museum, she took charge of the dismantling and later the reassembling of the specimen exhibitions. In 1919 she was promoted to assistant invertebrate paleontologist, a position that carried professional status, and in 1921 the survey published the first of her many bulletins, an account of the range of some of the Lower Ordovician faunal forms of the Ottawa Valley, with descriptions of some new species.²³³

Eager to explore other areas rich in Ordovician fossils, she spent the summer of 1920 along the western shore of Lake Winnipeg, camping and canoeing in that wild, uninhabited, marshy region, as she had done in childhood in locations to the north of Lake Ontario. Her companion was her young friend Madeleine Fritz (1896–1990), hired by the survey as “cook and canoe man.” Fritz’s early interests in fossils were strongly reinforced by her summer with Wilson, and she went on to a notable career in Canadian paleontology that included many years on the faculty of the University of Toronto and extensive studies of Ordovician bryozoa.²³⁴

About this time Alice Wilson suffered her second major health breakdown thought to have been the result of her chronic anemia. She was absent from the survey for nineteen months, a year of which she spent at the Clifton Springs (New York) Sanitarium; by December of 1922 she had returned to the survey, although by then she was burdened with considerable financial worries. Survey assignments during the rest of the 1920s resulted in pioneering studies of Ordovician fossils from western Canada and the Arctic islands. Her short paper describing a new Ordovician gastropod from British Columbia appeared in 1924.²³⁵

That year she reapplied for a leave of absence to carry out doctoral studies, suggesting possible topics in Ordovician fauna likely to be of future interest to the survey. Her application was supported by Edward Kindle, chief of the paleontology division, but the survey director, William Collins, declined to grant her leave, at least leave with pay. Collins, who at that time effectively controlled the museum, had little interest in promoting its scientific work; “He valued running a tight ship.”²³⁶ The needs of the survey came first, and he did not see Wilson’s usefulness to the survey as being much increased by further study; what the survey needed was staff for laboratory and museum work. In 1926 she found her own support in the form of a one-thousand-dollar scholarship from the Canadian Federation of University Women’s Clubs. When director Collins denied permission for their scholarship winner to take study leave, the federation appealed to the minister of mines and to the prime minister himself. With some reluctance the minister of mines and the survey granted leave without pay. Wilson’s struggle for financial support makes something of a contrast with the relatively ready help given by the National Research Council to plant pathologist Margaret Newton (see above) about the same time. But undoubtedly Canada’s need for well-trained agricultural specialists was then very much more urgent than her need for geologists.

Wilson began doctoral studies at the University of Chicago in 1926, at the age of forty-five, intending to study under the direction of Stuart Weller (1870–1927), a widely respected stratigrapher and paleontologist known for work on Carboniferous invertebrates; following Weller’s sudden death the following year, she completed her work under the much younger Cary Croneis (1901–1972, Ph.D. Harvard 1928), then at the beginning of his distinguished career. Confident and enthusiastic, Wilson was well regarded by her advisers and greatly enjoyed the comradeship of her fellow graduate students, as well as the contacts with workers from all over the country. Dividing her leave allowance so that she could also carry out her survey work, she spent four terms at the University of Chicago between the autumn of 1926 and the winter and early spring of 1929. Her thesis study made use of material she had gathered earlier while working on a survey carried out by the Canadian and United States governments prior to one of the periodic improvement projects of the St. Lawrence River–Great Lakes shipping route. It discussed the geology and paleontology of the region along the St. Lawrence around Cornwall, about fifty miles southeast of Ottawa. Her Ph.D. was awarded in 1929.²³⁷

Alice Wilson’s promotion from assistant paleontologist to assistant geologist came only in 1936, budgets having been tight and the museum very short-staffed during the depression years. In 1935 the Canadian government nominated her for an OBE (Officer of the Order of the British Empire), and the following year she was invited to join the Geological Association of America. No longer confined to the paleontology division after reclassification in December 1936, she advanced rapidly, becoming associate geologist in 1940 and geologist in 1945. In 1938 she was admitted to fellowship in the Royal Society of Canada, the first woman to receive the honor. Required to retire on her sixty-fifth birthday in August 1946, she nevertheless continued working at the survey on her full pay of \$4,080 per year, until the following May. Although then pensioned, she kept her survey office and continued her work on the Ordovician fauna of the St. Lawrence Lowland.

Begun about 1911 and carried out on foot, by bicycle, and latterly by car, her Ottawa Valley studies formed the greater part of her life's work; she was still occupied with them when she finally gave up her survey office in 1963. Her findings led eventually to a detailed map of the 5,500 square miles east of Rideau Lake (figure 4.2), a descriptive geological memoir,²³⁸ and her impressive series of survey bulletins describing most of the fossils of the Ottawa Formation, the most important region of the basin; several of these were published after she retired.²³⁹

During her later years she consulted for the national government and the Ontario provincial government, as well as for oil companies. From 1948 until 1959 she taught a course in paleontology at Carlton University, an institution established as Carlton College in 1942 largely to fill the needs of part-time adult students. Although then in her seventies, she led her classes to explore formations in the Ottawa region, her energy and enthusiasm undiminished. Long interested in popularizing geology, she often conducted tours for groups of children from Ottawa schools and for members of the Ottawa Field-Naturalists' Club. Her book on geology for children, *The Earth beneath Our Feet*, appeared in 1947, and her *Guide to the Geology of the Ottawa District* in 1956.²⁴⁰ The latter, which long remained a standard reference for the region, outlined eight field trips, described and illustrated various fossils of the region, and briefly explained the geological formation of the Ottawa Lowland.

She enjoyed travel and made several trips abroad, visiting countries in South America and the Caribbean, as well as attending geological conferences in Mexico and Britain. In 1960 Carlton University awarded her an honorary LL.D; by then she was becoming frail and was losing her eyesight. Alice Wilson died on 15 April 1964 in her eighty-third year. The donation she made to the Canadian Federation of University Women's Clubs provided funding for further education of university women.

Dalhousie University

Dalhousie University, now the largest and most widely known university in the Maritime provinces, was founded in 1818 by George Ramsay, ninth Earl of Dalhousie, lieutenant governor of Nova Scotia. Established as a nondenominational institution, it was open to students of all religious backgrounds, in contrast to the Anglican University of King's College, Windsor, founded three decades earlier and now part of Dalhousie.

Although nominally secular from its establishment, Dalhousie was long viewed as controlled by the Presbyterian Church of Scotland, and sectarian rivalry, along with the provincial government's lack of interest, considerably slowed its early development. A liberal arts course was offered briefly from 1838 to 1843 and even more briefly in the 1857–1858 session, but permanent opening with a well-qualified faculty of six came only in 1868. Steady progress followed throughout the rest of the nineteenth century. A medical faculty was organized in 1868, a faculty of science in 1878; women were enrolling by 1881, three years before they were admitted to McGill University and the University of Toronto. By then Dalhousie was to a large extent financially independent, thanks in part to a five-year fund-raising campaign (1870–1875) but mainly because of substantial gifts from George Munro, a Nova Scotian who had become wealthy as a publisher in New York City, and additional endowments from Alexander MacLeod and the Halifax businessman, judge, and politician Sir William Young.

The opening of Dalhousie University to women in 1881 took place without any particular struggle on their part, partly perhaps because women already had access to two denominational colleges in the Maritimes: Methodist Mount Allison Ladies' Seminary in Sackville, New Brunswick (from 1872 closely linked with Mount Allison College), and Baptist Acadia College in Wolfville, Nova Scotia, which had admitted women since its founding in 1840. There is little or no indication of male resistance at Dalhousie to the admission of women or of objection to their presence.

Several private schools for girls had existed in Halifax and other towns in the Maritimes from the late eighteenth century. The number of these establishments increased in the early nineteenth century, but the education they provided tended to be elementary and basic, with a strong component of subjects considered suitable for young ladies. By 1880 there were three good high schools teaching academic subjects: Pictou Academy in Pictou, Nova Scotia, open to women from at least 1880; Halifax High School, started in 1879; and Prince of Wales College, Charlottetown, Prince Edward Island,

coeducational from 1879, when it merged with the province's Normal School. Prince of Wales College provided instruction to senior matriculation level and at least a year of university-level instruction as well. In 1881–1882, the year women first entered Dalhousie University, only two of the institution's 116 regular and part-time students in the faculties of arts and science were women, but a decade later the numbers were very different, with 139 men and 128 women in the arts and science faculties, 3 women studying medicine, and 1 woman graduate student (Agnes Baxter, see below). Women students made up more than 20 percent of Dalhousie's arts and science undergraduates until well into the 1920s, many of them married women; most received honors degrees, and a high proportion went on to teaching careers. A much-needed residence hall, Shirreff Hall, funded by a wealthy widow, Jenny Shirreff Eddy, opened in 1923.²⁴¹

Dalhousie University's first woman graduate, MARGARET FLORENCE (MAGGIE) NEWCOMBE,²⁴² later TRUEMAN (b. 1859?), the daughter of John C. Newcombe and his wife, Abigail, née Calkin, was born about 1859 in the small community of Grafton, King's County, Nova Scotia. One of two women who enrolled at Dalhousie in 1881, she was awarded a B.A. with honors in English and English history in 1885. She then taught for a short time in a school for young ladies in St. John, New Brunswick. In 1890 she married Professor James Starr Trueman of Point de Bute, New Brunswick, but was widowed two years later. Her teaching career continued, her second position being at the Halifax Ladies' College, now Armbrae Academy, where she was a staff member for more than thirty years and principal from 1911 until she retired in 1918.²⁴³

Two years after Margaret Newcombe's graduation, one of the most notable of Dalhousie's pioneer women graduates, ELIZA RITCHIE²⁴⁴ (1856–1947), was awarded her B.A. degree. The youngest of at least three daughters of Justice J. W. Ritchie, Eliza was born in Halifax on 20 May 1856. She was educated at home before matriculating in 1883 at Dalhousie, where, as she later wrote, women's entry came readily: "no fight, inch by inch, had to be fought, as in other places."²⁴⁵ After receiving her B.A. in 1887, she went on to graduate studies in philosophy at Cornell University. Her Ph.D. was awarded two years later, in 1889, following completion of her studies on the problem of personal identity, an area of continuing argument between philosophers and theologians seeking to answer the question "Who am I?";²⁴⁶ her doctorate was probably the first received by a Canadian woman. A short period of post-doctoral study in Leipzig and Oxford was followed by a teaching appointment at Wellesley College, Massachusetts, then in the early stages of developing what became a notably successful department of philosophy.²⁴⁷ Eliza Ritchie was probably the only philosophy instructor there at that time who already held a doctoral degree. She was promoted to associate professor about 1895 but returned to Halifax in 1899 after ten years at Wellesley.

For a time she taught philosophy at Dalhousie, and although this work was done on a voluntary basis and not as a regular staff appointment, it earned her the honor of being considered the first female university instructor in Nova Scotia. Very much a feminist and a supporter of higher education for women, she soon took a major role in the development of the Dalhousie Alumnae Association. In 1912 when the alumnae, to help relieve the acute shortage of suitable lodgings for women students, rented the house they called Forrest Hall, they appointed Eliza Ritchie warden. Since Forrest Hall could accommodate only eleven students in addition to its two maids, she lost no time in appealing to Dalhousie's board of governors for additional residential space for women; the request was finally fulfilled a decade later, thanks to a substantial private gift (see above). A frequent contributor to the *Dalhousie Review*, she also served on its editorial board.

Along with her sister Mary, a strong supporter of women's suffrage, Eliza Ritchie became one of the leading and influential figures in the Halifax Women's Movement. Committed also to the overall development of Halifax and the Maritime region, she was much involved with the Nova Scotian College of Art, an institution founded in 1887 as the Victoria School of Art and long an important part of the cultural and educational life of Halifax. As well as her articles in local publications, she edited the anthology *Songs of the Maritimes*.²⁴⁸ Her 1919 appointment to the Dalhousie board of governors, on which she served until 1925 and again in 1927, was widely considered the first such appointment of a woman to the board of governors of a Canadian university. Dalhousie awarded her an LL.D. in 1927. Eliza Ritchie died at her home in Halifax on 5 September 1933 in her seventy-eighth year. Eliza Ritchie Hall and the Eliza Ritchie Doctoral Fellowship for Women commemorate her pioneering achievements.

In her 1896 article in the *Halifax Herald*, Lucy Maud Montgomery, author of the well-known *Anne of Green Gables* series, then a non-degree-seeking student at Dalhousie, reported that four of the early women students graduating between 1886 and 1895 received honors in mathematics and mathematical physics;²⁴⁹ the number is remarkable for the period. Although not the first to earn honors in this area, the most distinguished of these early women who concentrated on mathematics and mathematical physics was probably AGNES SIME BAXTER,²⁵⁰ later HILL (1870–1917).

The daughter of Scottish immigrant Robert Baxter and his wife, Agnes was born in Halifax on 18 March 1870. Robert Baxter, manager of an electric light company in Scotland before emigrating, was foreman and then manager of the Halifax Gas Light Company; the family was relatively well off.

Little is known of Agnes Baxter's childhood, except that she had "long and careful preparation" before matriculating at Dalhousie in 1887 when she was seventeen.²⁵¹ Perhaps it was no surprise that Agnes, a serious and able student, chose mathematics and mathematical physics as her principal subjects. Mathematics professor Charles Macdonald, who had a brilliant academic record as an undergraduate at King's College, Aberdeen, was the most popular professor on the faculty. An outstanding teacher, he was much appreciated by his students for his thoroughness; his honors students regularly distinguished themselves. James Gordon MacGregor, Dalhousie's first Munro Professor of Physics, a student of Macdonald's who had gone on to doctoral studies overseas, was a highly gifted, nervous man; much of his intense energy went into his teaching.²⁵²

Agnes had an outstanding undergraduate record, her 1891 B.A. degree being awarded with first-rank honors in mathematics and mathematical physics; she also received the Sir William Young Gold Medal for the highest-standing honors student in these subjects. Another year of mathematics study at Dalhousie brought her an M.A. in 1892, after which she went to Cornell University, supported by a doctoral fellowship.

The fledgling graduate program in Cornell's mathematics department was then developing steadily, largely thanks to the vigorous leadership of James Edward Oliver (1827–1895). Oliver, although not primarily a research mathematician, established a strong connection with Felix Klein of Göttingen University and introduced successful German ideas on doctoral-level mathematics instruction to Cornell. Agnes Baxter's work on Abelian integrals, supervised by Oliver, earned her a Ph.D. in 1895. She was the second Canadian woman to be awarded a doctorate in mathematics, the first being Annie MacKinnon Fitch, who received hers, also from Cornell, the preceding year.²⁵³ Agnes Baxter is reported to have edited Oliver's mathematical notes following his death in 1895;²⁵⁴ however, no information about these has been uncovered.²⁵⁵

In 1896 she married fellow Nova Scotian and Dalhousie graduate Albert Ross Hill, who had also gone on to doctoral studies at Cornell; he received his Ph.D. in philosophy in 1895. After the marriage Agnes did no further work in mathematics, choosing instead to spend her time bringing up her daughters and giving her full support to her husband's notable career in teaching and university administration. The Hills spent seven years at the University of Nebraska, Lincoln, where Ross Hill took a major role in the ongoing work of developing the philosophy department. The family, which now included two children, Jessie, born in 1897, and Esther, born in 1903, moved to Missouri in 1904, Hill having accepted the position of dean of the University of Missouri teachers' college. A short period at Cornell followed when he served as dean of the College of Arts and Science. Agnes Hill's final move was back to Missouri when her husband became president of the University of Missouri in 1909. She died in Columbia on 9 March 1917, a few days before her forty-seventh birthday; because of weakened resistance caused by a serious earlier condition, she was unable to withstand a final short illness. Her obituary in the *Dalhousie Gazette* described her as a quiet, gentle, reserved woman, one of the university's most notable graduates. In her memory Ross Hill donated one thousand dollars to Dalhousie to buy a collection of books in her area, as the start of a library in mathematics and mathematical physics. Further recognition came in 1988 with the dedication of the Agnes Baxter Reading Room in Dalhousie's Department of Mathematics, Statistics, and Computer Science; the Sir William Young Gold Medal she won in 1891 became part of the department's display on that occasion. She had been a member of Sigma Xi from 1904.

Dalhousie University had an outstanding professor of chemistry, George Lawson, who is known to have welcomed women's participation in scientific work (see sketches of Lucy Lawson and Maria

Morris, above); however, although there were chemical laboratories at Dalhousie from 1890, none of the earliest women students appear to have concentrated on this subject.

The training of medical doctors at Dalhousie began in 1868, with a full medical course being offered by 1870 and the first degrees granted in 1872. Space shortage led to the establishment in 1875 of the separate Halifax Medical College, which soon after affiliated with Dalhousie, becoming the university's faculty of medicine. Nevertheless, throughout the 1890s it remained essentially a separately controlled institution, the responsibility of the university being largely the provision of instruction (by George Lawson) in chemistry and botany.²⁵⁶ As they were in other fields, Nova Scotia and New Brunswick were the most liberal provinces in Canada with respect to admitting women to medical studies. Dalhousie was coeducational in medicine from 1888, but only a few women in the Maritimes earned medical degrees before 1900. These few were "meeting with encouragement and even success in practice."²⁵⁷ The career of only one of these early medical women is sketched here.

ANNIE ISABELLA HAMILTON,²⁵⁸ (1866–1941), the first woman graduate in medicine in Nova Scotia, was born on 17 March 1866 in Brookfield, Coldchester County, Nova Scotia. She graduated from Truro Normal School and also attended Pictou Academy, a school with high academic standards, which awarded her a gold medal of excellence. As a medical student at Dalhousie in the early 1890s she was seen as "fiery and determined"; she is reported to have tried, without success, to convert her male classmates to feminism and teetotalism.²⁵⁹ After graduating M.D.Ch.M. in 1894 she set up practice among the poor and working-class of north-end Halifax. The town's middle classes considered her somewhat odd, since she made her house calls by bicycle, wearing a divided skirt. In 1903 she went to China as a medical missionary and teacher, China being one of the countries where Canada had established its overseas missions; her career path was one chosen by a number of Canadian women doctors about that time. Halifax was sorry to lose its popular, eccentric doctor, but Annie Hamilton spent the rest of her life overseas, returning only once, in 1936, to visit her family in Halifax. She died in Shanghai on 21 December 1941 at the age of seventy-five.²⁶⁰ The Annie Hamilton annual scholarship for a second-year medical student at Dalhousie University was established in her memory.

Two smaller universities in the Maritimes, Mount Allison in New Brunswick and Acadia in Nova Scotia, are especially notable in the early history of higher education for Canadian women. Both are denominational—Mount Allison being Wesleyan Methodist and Acadia Baptist—and both started in the late 1830s as secondary schools, which developed into sound, liberal arts colleges during the second half of the nineteenth century. Although these were undergraduate teaching institutions that did not then aspire to becoming research universities, their role as early providers of women's education in general liberal arts, often considered the prerequisite for more-advanced work, suggests the inclusion of a brief note here on their early history.

Mount Allison University

Located in Sackville, an important shipbuilding town in the late nineteenth century, Mount Allison was established as the Wesleyan Academy for boys in 1839; a girl's school, later known as Mount Allison Ladies' College, was opened in 1854, its first-term enrollment of 118 surpassing by 6 that of the boys' academy and making it at the time the major school for girls in the Maritimes. Thanks to the advanced ideas of the first preceptress, Mary Electra Adams, the curriculum of the girls' school, while not neglecting the expected "social" training, placed a major emphasis on the academic and imposed high intellectual standards.

When the degree-granting Mount Allison College was organized in 1862, the Ladies' Academy, by then part of the institution, also began to offer a graduating diploma, mistress of liberal arts (M.L.A.); this remained the highest qualification awarded to a woman until the opening of Mount Allison College degrees to women. By the 1860s senior Ladies' Academy students could attend college classes as part of their own collegiate course, and by 1872 women were able to enroll and receive degrees in liberal arts and other faculties on the same terms as men.²⁶¹ The date compares well with admission dates for women at universities in other countries of the British Empire, New Zealand's University of Otago opening to women in 1871, Canterbury Collegiate Union, Christchurch, in 1874, and Australia's University of Adelaide also in 1874. The first woman to receive a degree from Mount Allison College

was Grace Annie Lockhart, who has the honor of being the first woman B.Sc. graduate in the British Empire.²⁶²

GRACE ANNIE LOCKHART,²⁶³ later DAWSON (1855–1916), the daughter of Edward E. Lockhart and his wife, Susan, née Whittier, was born on 22 February 1855 in St. John, New Brunswick. She enrolled in the Ladies' Academy in 1871 at the age of sixteen and was awarded its M.L.A. diploma in 1874. By then, most of her required collegiate courses having already been taken, she needed only one year as an officially registered student at Mount Allison College to complete the requirements for the degree of bachelor of science and English literature. During that year she was the only woman student registered at the college.

She taught for about six years at a school in St. John until her marriage in 1881 to her former Mount Allison College classmate, Methodist minister Rev. John L. Dawson of St. John's, Newfoundland. Following her marriage, after which she moved every three years or so, according to her husband's postings, her time was taken up by church-related work and the upbringing of three sons, all of whom became students at Mount Allison University. She died at the age of sixty-one on 18 May 1916 at Charlottetown, Prince Edward Island; burial was at Tryon, about twenty miles west of Charlottetown.

After Grace Lockhart's graduation in 1875, several years passed before any other women took advantage of the opportunities offered by Mount Allison College. During the 1880s only three graduated, the first being HARRIET STARR STEWART²⁶⁴ (1862–1931). Born on 8 April 1862 in Lunenburg, Nova Scotia, Harriet was the younger daughter in the family of four children of the Rev. Charles Stewart, an immigrant from Glasgow, Scotland, and his wife, Harriet Augusta, née Starr. Little has been discovered about her early life, but she may have been educated privately until she was about eighteen. For a time she was registered as a student at the University of Halifax, an examining and degree-granting institution only, but she enrolled at Mount Allison College following the abolition of the former in 1880. Her 1882 B.A. from Mount Allison College, where her father was professor of theology, was the first bachelor of arts degree awarded to a woman by a Canadian university. Further studies earned her an M.A. in 1885, when she was twenty-three. From then on her work centered on service in organizations of the Methodist Church. Staying on at her home in Sackville, she became active in the Women's Christian Temperance Union, but her main efforts were in the field of overseas missions of the Methodist Church (later part of the United Church of Canada). As corresponding secretary of the national Women's Missionary Society of the Methodist Church and editor of the society's magazine, *The Palm Branch*, she traveled frequently throughout Canada, often addressing large audiences from platform or pulpit. In 1917 she moved to Regina, Saskatchewan, to take charge of the household of her younger brother, Charles Stewart, following the death of his wife. She nevertheless continued her church work until the late 1920s, when her health began to decline. Harriet Stewart died in 1931, when she was about sixty-nine.

Some scanty information has been collected about one or two of the early students of the Ladies' College who received M.L.A. diplomas before 1890 and went on to medical studies in the United States. The first was MARIA L. C. ANGUIN,²⁶⁵ daughter of the Rev. Thomas Anguin of Dartmouth, Nova Scotia. She received her M.L.A. diploma in 1869 and some time later enrolled at the Woman's Medical College of the New York Infirmary for Women and Children, which awarded her an M.D. in 1882. The first woman practitioner in Halifax, she worked there for about fifteen years, until her death in Ashland, Massachusetts, on 25 April 1898.

MARY CHRISTINE BEIN MCKAY,²⁶⁶ later BUCHANAN (d. 1935), daughter of James McKay of Stellarton, Nova Scotia, had a somewhat longer medical career than Maria Anguin. She received an M.L.A. diploma from the Ladies' College in 1883 and an M.D.Ch.M. from the Woman's Medical College, Toronto, in 1888. She then went as a medical missionary to the Indore Presbytery in central India, where she met fellow medical missionary the Rev. John Buchanan, M.D., of the Canadian Presbyterian Church. Following her marriage to Buchanan in 1889 she joined him in work among the very poor in the city of Ujjain, a population ravaged by epidemic diseases such as cholera and smallpox. Her second child died of dysentery as an infant. In 1897 John Buchanan opened a mission station at Amkhut in a remote valley in the Vindhya mountain region, about thirty miles south of the city of Indore; there the Buchanans worked among the Bhil people for many years. In 1916 a bell was mounted at the mission station that served the valley as its only timepiece until 1994, when it developed a fatal crack. Efforts

to replace it continued through the 1990s. Mary McKay suffered from poor health throughout most of her time in India but nevertheless succeeded in continuing her work as a doctor and teacher. She died in 1935.

Acadia University

Founded by the Nova Scotia Baptist Education Society in Wolfville in 1838 as Queen's College, the institution was renamed Acadia College in 1841. Its roots went back even further, to Horton Academy, a high school for boys opened ten years earlier. A school for young ladies, which later became the Female Department of Horton Academy, opened in Wolfville in the late 1850s. Equal access to all, regardless of religious affiliation or gender, was one of the college's founding principles. This meant that when the academy was integrated into Acadia College, its female seminary section also became part of the college, a change that gave the female section its own building on the college campus. Until 1926 the academy, latterly reorganized as the coeducational Horton Academy of Acadia University, provided precollege education for both boys and girls going on to become students at Acadia University.²⁶⁷

Women were attending classes at Acadia College by at least the 1870s and possibly in the 1860s, but the first woman to receive a degree was Clara Marshall, who graduated in 1884.

CLARA BELLE MARSHALL,²⁶⁸ later RAYMOND (1860–1939), was born in the rural community of Mount Hanley, Nova Scotia, a short distance inland from the Bay of Fundy, on 13 January 1860. She attended a country school in Mount Hanley and then Lawrencetown High School, a more advanced school in Lawrencetown, some six miles inland; her B.A. degree from Acadia College was awarded in 1884, when she was twenty-four. She then taught for two years at the Acadia Ladies' Seminary, until her marriage in 1886 to E. W. Raymond of New York. Yonkers, New York, was her home until 1904, but by 1909 at the latest she had returned to Wolfville, where she became matron at the Acadia College girls' residence. She held this position until 1919 and then went back to New York, where she lived with her daughter Mary until her death at age seventy-nine on 28 May 1939. Scholarships at Acadia University commemorate her name. The Mount Hanley school she attended, although no longer a functioning school, is now classed as a Nova Scotia Historic Place.

One of the most notable of the pre-1900 Acadia women graduates was Annie MacLean, now remembered for her wide-ranging studies in sociology, particularly her investigations of the conditions of women workers in industry and commerce in the United States in the early years of the twentieth century.

ANNIE MARION MACLEAN²⁶⁹ (d. 1934), one of four children of Baptist minister Rev. John MacLean and his wife, Christina, was born in the small fishing community of St. Peters Bay on the north coast of Prince Edward Island, probably in the late 1860s or early 1870s. She began studies at Acadia College about 1889, received a B.A. in 1893, and an M.A. in 1894.

Having by then decided to specialize in sociology, she moved to the new University of Chicago, where she studied under Albion Woodbury Small. The university's department of sociology was the first American university department in this field and the first accredited sociology department anywhere to offer both undergraduate and graduate degrees. As chairman of the department, Small was then in the process of not only developing his unit but establishing sociology as a valid field for academic study.²⁷⁰ His teachings emphasized the value of detailed, on-site, personal investigations into the practical (nontheoretical) problems that were besetting parts of contemporary society. Although now out of style and considered applicable to a specific historical period only, his approach played an important role in the development of sociology in the United States.

Annie MacLean's work followed these lines; her first three papers, which appeared in the *American Journal of Sociology* started by Small in 1895, reported her graduate-level investigations into the work conditions of wage-earning women in the labor force.²⁷¹ She was awarded a Ph.M. in 1897 and a Ph.D. in 1900.

Her first teaching position was at Royal Victoria College, the women's part of McGill University, Montreal, where she was one of the five women appointed to the first academic staff assembled after the college opened in 1899; as resident tutor she taught economics and history for several years.²⁷² From 1903 until her death in 1934 she was extension assistant professor of sociology at the University

of Chicago, her teaching being done by correspondence through the university's Home Study Department. After twenty years of experience in this work, she published her thoughts on the great value of correspondence courses to students in many different circumstances; in the same paper she provided statistical data on the geographical distribution and occupations of the almost eight hundred students she had taught in the six sociology courses she regularly offered.²⁷³ For a number of years she also held teaching positions at a succession of other institutions. From 1903 to 1916 she taught sociology at the YMCA New York National Training School, and from 1906 until 1916 she was part-time professor of sociology at Adelphi College, New York City, a women's college from 1912 until after the Second World War. While there she steadily continued her research, bringing out at least eight publications, including two books, over the ten-year period.

One of the earliest of these publications reported in detail her investigations of the lives of women in the two large coal-mining regions of Pennsylvania; the work formed part of a broad national study MacLean carried out for the YWCA in 1907–1908. Two field investigators spent six and a half weeks in the anthracite fields of northeast Pennsylvania and the bituminous fields of the southwestern part of the state studying a selection of representative communities. While conditions in the mines had already been documented, no attention had yet been given to the lives of the women in these communities. Most of the mine workers being foreign laborers, the study concerned the lives of immigrant women, many from central Europe, Lithuania, and Italy, and most of them Catholic. They lived in communities isolated by language and grinding poverty from contact with other Americans, occupying poorly built company houses that often lacked sanitation; their days were spent looking after as many single, male boarders as could be packed into the limited space they had. Typhoid fever was not uncommon, the principal form of recreation was beer drinking, and many illegitimate children were born. Some of the larger towns had silk mills and shirt factories that employed women and girls, including underage girls, but most were fully occupied in their own homes. The paper provides an example of Annie MacLean's style of detailed, painstaking investigation of the deplorable living conditions of the poorer classes in American society. A similarly detailed study of the living and working conditions of the Oregon hop-pickers followed in 1909–1910.²⁷⁴

Her most important publications were probably *Wage-earning Women* (1910) and *Women Workers and Society* (1916).²⁷⁵ Her writing was seen as having a force and directness that was never dull or dry, despite the fact that she incorporated a considerable amount of quantitative (statistical) data into her descriptive accounts. The style of presentation gave the story tone and color and left the reader with strikingly vivid impressions. The work was considered well done, the findings and recommendations valuable.

She also brought out work on more general subjects, such as her thoughts on the accumulation by especially able and successful people of great personal wealth.²⁷⁶ Although she decried the current scramble for money, she argued that while society encouraged money-making and endorsed a system that allowed the amassing of large fortunes, people who had superior acquisitional talents could not reasonably be condemned. Several more publications appeared in the years up to 1925, but from 1924 on her health was declining and all her energies were taken up by her University of Chicago correspondence courses.²⁷⁷ She died on 1 May 1934 at her home in Pasadena, California, when she was probably in her late sixties.

In some of its aspects Annie MacLean's work might be compared with that of American industrial toxicologist Alice Hamilton.²⁷⁸ Both of these early twentieth-century investigators made significant contributions to the task of directing attention to the living and working conditions of the immigrant laboring classes of the period in the United States.

Queen's University

The first university in Canada west of the Maritimes to admit women, Queen's in Kingston, Ontario, was founded in 1841 as Queen's College. In its early years it functioned to a large extent as a theological school for the training of Presbyterian ministers, but nevertheless, in common with McGill, Toronto, and Dalhousie universities, it followed the pattern of the old Scottish universities in providing instruction in the sciences and liberal arts, rather than adopting the Oxford classical tradition. Although

handicapped by serious periodic dissension both within its faculty and between faculty and board of trustees, it steadily continued the ambitious program it had set itself of building Queen's into a major university. Its struggles for adequate finances were somewhat lessened by 1912, when it became independent of the Presbyterian church and therefore eligible for government grants; by the end of the First World War Queen's, if still not as well funded as McGill or Toronto, had grown into an important research university.²⁷⁹

Noteworthy points in Queen's early development and in establishing its good relations with the city of Kingston came in the late 1850s and early 1860s, and this cordial relationship was later to prove very valuable for the women medical students at Queen's. In 1858 George Lawson (see also the section on Dalhousie, above) was appointed professor of chemistry and natural history; within a year or two he had established Canada's first botanic garden and a herbarium within the college grounds and was providing a series of popular public lectures. In 1861 the Kingston Observatory, in what is now City Park, was transferred to the college, together with one acre of the park. Until then run and largely funded by a group of Kingston gentlemen amateur astronomers, the astronomical observatory was Ontario's first.²⁸⁰ From shortly after his appointment, James Williamson, the first professor of mathematics and natural philosophy at Queen's College, gave much time to work at the observatory. Following the 1861 agreement, the college took over the running of the observatory in return for a number of services to the city, including six public lectures per year, weekly corrections to the city clock, and a contribution of funds for a new observatory building with central dome, transit room, and a room for observers and the public. While no reference has been found to the presence of women and girls at these public lectures on astronomy or Lawson's botany lectures, it is not unreasonable to suppose that they were in the audiences.

By the 1860s, when the question of education for girls and women was being debated in Britain, Queen's College began to consider extending enrollment to women. An important factor was pressure from the college's active missionary society to open a number of science classes to women; only female medical missionaries, who required some science background, could give medical care to women in the society's Far East regions of activity. A start was made in 1869 when a special class in English was offered; twenty women attended. Two more classes, natural history and rhetoric and logic, were added the following year, and by 1876 women were allowed to attend regular classes with men in chemistry; all arts and science classes opened to women in 1878. Unlike their controversial entry into McGill and University College, Toronto, women appear to have slipped quietly, a very few at a time, into the arts and science program at Queen's without a great deal of notice being taken of their presence. Throughout the late 1860s, a difficult period for Queen's because of severe financial troubles and falling enrollments, the support of Kingston High School and Grammar School (now Kingston Collegiate and Vocational Institute) provided significant assistance to the college. Kingston's only public secondary school, it established, in cooperation with the college faculty, special preparatory classes for students going on to Queen's; furthermore it admitted girls from 1877.

The first two women to graduate from Queen's, Annie Fowler and Eliza Fitzgerald, received B.A. degrees in 1884. (ELIZA) ANNIE FOWLER²⁸¹ (1863–1945) was the elder daughter of Rev. James Fowler (1829–1923) and his wife, Mary Ann, née McLeod (1827–1890). A New Brunswick man, Fowler had spent several years investigating the plants of his native region before he accepted the position of lecturer in natural science at Queen's in 1880. Annie completed her secondary schooling at the Collegiate High School, now Fredericton High School, in Fredericton, New Brunswick, before moving with her family to Kingston in 1880. She was then seventeen. Encouraged by her father, who was in favor of higher education for women, she enrolled at Queen's in October 1880, the first female full-time student in the university's four-year B.A. program. The required science courses for all undergraduates in this program included mathematics and either chemistry or physics but no natural science; whether or not Annie elected to study the plant sciences, with which she most likely had some familiarity because of her father's extensive collecting, has not been determined.²⁸² Like a great many of the first generation of women students at Canadian universities, she concentrated on modern languages, whatever her earlier interests may have been. She won a prize for junior level French in 1881 and one for senior French in 1882. Little is known of Annie's later work, but after the death of her mother in 1890 and

the departure for China in 1891 of her younger sister Jamie with her medical missionary husband, her time appears to have been taken up caring for her father. He lived until 1923, active for most of his last years, although his mental abilities declined until eventually he recognized no one but Annie. She died in Kingston in 1945.

ELIZA FITZGERALD²⁸³ (b. 1860) was a grocer's daughter who attended St. Catharines Collegiate Institute, a school that by the later nineteenth century provided education for girls beyond the high school level. She passed the matriculation examinations for entry into University College, University of Toronto, in 1879, receiving first-class honors in English, French, German, and history, and third-class in mathematics and classics. Failing to get admission to lectures at University College, she enrolled at Queen's in 1881 at the age of twenty-one. She won a prize for junior-level chemistry in 1883 but nevertheless chose to concentrate on classical studies, both Latin and Greek. Along with her 1884 B.A., she was awarded the gold medal for classics. A woman whose academic interests clearly covered a broad spectrum, Eliza Fitzgerald went on to a notable career in high school teaching in Ontario. She is commemorated at Queen's in the Eliza Fitzgerald Prize, awarded to the highest-standing woman student in second-year studies.

The story of the earliest women medical graduates of Queen's University is somewhat more widely known and considerably more dramatic than that of the earliest arts and science graduates.²⁸⁴ Queen's medical school started in 1854–1855 as a collaborative effort with Kingston physicians, the university being the degree-granting authority; when the university opened to women in 1879, they therefore became eligible to enroll in the Kingston Royal College of Physicians and Surgeons, the name taken by Queen's medical school.

In 1880 four women enrolled at the Royal College, the first women to be admitted to a medical course at a Canadian university. Classes went smoothly for three years, but in the 1883–1884 session, one young physiology lecturer, who considered he had been snubbed by senior colleagues and was intent on stirring up trouble, began enlivening his lectures with risqué anecdotes highly offensive to the women students. The younger male students enthusiastically followed his lead. When the women eventually walked out and complained to the administration, the male students asserted their power. All eighty threatened to leave Queen's and transfer to other medical schools, such as Trinity College Medical School in Toronto, if women were to continue at the Royal College. Faced with this possibility, Queen's, with help from the city of Kingston, raised a small endowment by private subscription and established Kingston Women's Medical College. The city council was willing to provide classroom space in City Hall, members of the Royal College faculty and others agreed to lecture for only a small honorarium, and the women's college was affiliated with Queen's University on the same terms as the Royal College. Reports of the controversy spread quickly across Ontario and Quebec, causing a considerable stir.²⁸⁵

The first three Kingston women graduates, Alice McGillivray, Elizabeth Smith, and Elizabeth Beatty, received Queen's University M.D. degrees in 1884. In 1894, two years after the Royal College of Physicians and Surgeons finally became fully integrated with the university as Queen's faculty of medicine, the Kingston Women's Medical College was closed; feeling the need to reduce expenses, and believing that medical schools in Toronto and Montreal were adequate to meet women's needs, Queen's advised its female medical students who had not yet completed their work to move to one or the other of these cities. Fifty years were to pass before women were once more admitted to medical studies at Queen's.

Of the three women from Kingston Women's Medical College who graduated in 1884, the best known is probably ELIZABETH SMITH,²⁸⁶ later SHORTT (1859–1949). The third child and only daughter of Sylvester Smith, a farmer, and his wife, Damaris Isabella, née McGee, Elizabeth was born on 18 January 1859 at Mountain Hall in the small community of Winona, Ontario, now part of the city of Hamilton. The Smiths were a prominent family in Winona. Silas Smith, Elizabeth's great-grandfather, a pioneer farmer of United Empire Loyalist (American loyalist) persuasion, had crossed the Niagara frontier and settled in Canada in 1787. Her mother, Damaris McGee, was a woman of feminist outlook and remarkable foresight who fully supported Elizabeth in her quest for medical training. Under the leadership of Elizabeth's brother Ernest D'Israeli Smith, the family farm had by 1882 developed into the prosperous E. D. Smith fruit growing and shipping business.²⁸⁷

The family being reasonably well off, they were able to provide Elizabeth with a tutor in her earliest years and send her on to secondary education at Hamilton Collegiate Institute, one of the few schools in Ontario that provided instruction for girls to university entrance standards. After a few years of school teaching, perhaps in one of several elementary schools by then established in the community, Elizabeth, now fully determined to become a physician, took and passed the matriculation examination for entry to the Kingston Royal College of Physicians, Queen's University. Following a suggestion from Jennie Trout, Canada's first licensed female doctor,²⁸⁸ she had initially planned to train at the much-respected University of Michigan Medical School in Ann Arbor.²⁸⁹ But having learned that the Royal College of Physicians and Surgeons in Kingston might admit her, she applied and was duly allowed to enroll in 1880; Elizabeth Beatty, Alice McGillivray, and Annie Dickson (who first studied chemistry in the faculty of arts and did not transfer to the medical course until 1881) enrolled at the same time. In the 1883–1884 session, the women moved to the newly opened Kingston Women's Medical College (see above). Elizabeth Smith received a Queen's University M.D. degree in 1884.

For two years she conducted a general practice in Hamilton but in 1886 married Adam Shortt (1859–1931), a fellow graduate of Queen's, who that year became professor of politics and economics at his alma mater. She returned to Kingston and joined the faculty of Kingston Women's Medical College, where she taught medical jurisprudence and sanitary science during the late 1880s and the 1890s; for a time she may also have continued to practice. Two daughters and a son were born between 1889 and 1897. As she became more and more involved in public health activities over the years, particularly tuberculosis control, she gave up all the other parts of her medical career.

Following the family's move to Ottawa in 1908, when Adam Shortt was appointed to the newly created post of chairman of the Civil Service Commission, Elizabeth became very active in feminist movements, an area in which she had already worked while in Kingston. A strong supporter of the women's suffrage cause, she was also a member of the National Council of Women and served for a period as vice president. Among a number of her special interests was the provision of allowances and pensions for mothers of small children. With the coming of the First World War, she took part in many campaigns to help the war effort.

Elizabeth Shortt's social work continued during the 1920s, but after her husband died in 1931 she spent most of her time visiting family and friends, keeping up her considerable correspondence, and occasionally attending meetings of women's groups.²⁹⁰ She died in Ottawa on 14 January 1949, four days before her ninetieth birthday.

ALICE MCGILLIVRAY²⁹¹ (b. 1866?), Elizabeth Smith's classmate at Kingston Women's Medical College, was the most academically outstanding of the first three graduates. She won the chemistry prize at Queen's, a notable achievement, and was the university's valedictorian the year of her graduation. In her speech on that occasion, entitled "A woman's address," she expressed the women students' gratitude to the generous people of Kingston and to the Queen's professors who had done so much to make education available to women as well as men. Her broad outlook concerning advanced mental training for women is made plain in her remarks concerning the nature of that training: "whether it be Classics, Mathematics, Natural Science, Medicine or even a good sound collegiate education, is in a measure the same. True, she may never need in her after life to be familiar with Greek text, conic sections or the histology of liver, spleen or brain. That is not the desideratum of a full course of study, but to use and develop the talents whether they be five or ten."²⁹²

Starting her own work in education the following year, Alice McGillivray joined the staff of the Women's Medical College as lecturer in practical anatomy, in charge of the dissecting room. A year later (1886), after the resignation of Michael Lavell, professor of obstetrics and diseases of women and children, she was appointed his replacement, while at the same time continuing as lecturer in practical anatomy. In 1889 she became subdean of the college, while also serving as professor of obstetrics. In addition she took part in organizing a course of public lectures for Kingston women on health-related matters, particularly as they affected women and children.

Alice McGillivray's medical career was outstanding but most likely short. Whether it continued after the 1894 closing of the Women's Medical College has not been investigated. She had married very early and may by then have had major family commitments.

ELIZABETH BEATTY²⁹³ (d. 1940), the third of the 1884 Women's Medical College graduates, was the first Canadian female medical missionary of the Presbyterian church sent to India. Leaving Canada soon after her graduation, she went first to Britain to buy instruments, visit hospitals, and see friends in Scotland. In India she worked in the city of Indore, Central Provinces, living very simply among the poor.²⁹⁴ She set up a small hospital in her house, where she taught Indian women the basics of nursing, while herself learning Hindi. Strong and kindly, with a forthright, no nonsense style, she was quickly accepted by the people. Her care of the Maharani of Indore led to a friendly relationship that eventually resulted in the construction of the first hospital for women in central India; building was already in progress when Elizabeth Beatty's health deteriorated and she returned to Canada. She continued to work intermittently but gradually went into retirement, living with her sister in Utica, New York, until her death in 1940.

In 1888, four years after the first three medical women graduated, AGNES DOUGLAS CRAINE²⁹⁵ (d. 1937) received a Queen's University M.D. degree. Agnes was the daughter of J. J. Craine of Smiths Falls, about fifty miles northeast of Kingston. Following her graduation with honors from Queen's, she and her mother sailed for Britain, where, after further studies, she passed qualifying examinations and became licentiate of the Royal College of Physicians and Surgeons, Edinburgh (LRCP, Edinburgh). After she returned to Canada, she set up a practice in Smiths Falls, where she worked for most of the rest of her life.

Agnes Craine is remembered particularly at Queen's for the Craine Foundation, endowed by her in 1935 with a gift to the university of \$340,000 in memory of her parents and brother. Part of the money was used, with her approval, for the construction of the much-needed Craine Building, the only new building opened on the campus during the depression years of the 1930s and the home of the biochemistry department until 1983; the Agnes D. Craine professorship in biochemistry is also funded by the Craine Foundation. Agnes died in 1937, about eighteen months after making her generous donation to Queen's.

Following the outbreak of the First World War, Queen's was the first Canadian university to send volunteers overseas. By the spring of 1915, three hundred students, staff, and alumni had enlisted; staff were paid half their usual salary while on active service. Queen's women formed part of the medical team that established and staffed the Queen's Stationary Hospital of the Canadian Expeditionary Force in Cairo and after it transferred to France in 1916. In addition, women most likely assisted in the military hospital organized for the duration in two of the Kingston campus buildings, and from the beginning of the conflict they were very active in Red Cross fund-raising in Kingston.

With the departure of so many men, both students and academic staff, women became increasingly prominent on the Queen's campus. In 1917 two women were on the editorial staff of the *Queen's Journal*, one, Charlotte Whitton, being the journal's editor-in-chief.²⁹⁶ That year also saw the appointment of Queen's first two women to the teaching staff, the desperate shortage of qualified male faculty having impelled the university to employ "female labour" at least as a temporary measure.

The first two women drawn from this hitherto untapped resource were Wilhelmina Gordon and May Macdonnell. Wilhelmina Gordon²⁹⁷ (1885–1968), the youngest child in the family of Daniel Gordon, principal of Queen's from 1902 to 1916, and his wife, Eliza Simona, née MacLennan, graduated from Queen's in 1905 with an M.A. and the gold medal in English. In 1909, after graduate experience at Bryn Mawr College and Somerville College, Oxford, she began teaching as a tutorial assistant in English. As the daughter of a principal whose hospitable wife had readily opened her home to students, especially the women, Wilhelmina had been well acquainted with Queen's undergraduates for many years. Promoted to a staff position in 1917, she became assistant professor of English in 1925 and associate professor in 1930. After more than forty years in the English department, she retired in 1950 at the age of sixty-five. May Macdonnell joined Queen's classics department teaching staff in 1917. Like Wilhelmina Gordon, she stayed at Queen's for several decades, latterly becoming professor of classics.

University of Manitoba

Established in 1877, the University of Manitoba is western Canada's oldest provincial university. Its roots go back much earlier, the Catholic Church having opened a school for boys, St. Boniface, in the

Red River Settlement in 1818 and a school for girls, run by nuns, in 1829. Also in the 1820s came the Church of England's St. John's schools, which were reorganized by 1866 into what became the present St. John's College; an Anglican school for girls was available throughout much of the period. The region's Presbyterian settlers had provided their own public elementary school without church help by 1847, but by 1871 Manitoba College was established, largely through the efforts of the Presbyterian church.

In 1877 these three denominational units—St. Boniface (by then St. Boniface College), St. John's College, and Manitoba College—took the unusual step of cooperating in the organization of the University of Manitoba, an examining and degree-granting body that acted for students of all three colleges; the Methodist Church's Wesley College became part of the university in 1888. By the beginning of the twentieth century, provincial, government-supported higher education in secular subjects was being provided centrally by the university. Although science subjects were taught in the colleges from about 1890, it was only in 1904 that separate facilities were provided for instruction in the sciences and funding was acquired for the appointment of professors of botany, physics, chemistry, mathematics, physiology, and bacteriology.²⁹⁸

With the university's founding date of 1877, it is perhaps hardly surprising that women were among the early graduates; by the 1890s a few even held junior staff positions, particularly in the modern language department. One of these women was LAURA ETHEL SPARLING,²⁹⁹ later POVAH (1878–1916), a Wesley College student. Born on 10 April 1878, she was the daughter of Joseph Walter Sparling, principal of Wesley College, and his wife, Susannah Mary Weir, née Kerr. After being awarded a University of Manitoba B.A. and the Governor General's Silver Medal in modern languages in 1897, Laura Sparling served for two sessions as tutor in the matriculation department of Wesley College before going to Berlin for further studies. Later, as Mrs. Povah, she continued to assist in the modern language department until a regular junior staff appointment was made for her.

Manitoba College of Medicine affiliated with the University of Manitoba in 1883. Women were admitted from the beginning; the first to graduate, Harriet Foxton Clarke, received her degree in 1892 after completing her first two years at the Toronto Woman's Medical College. The best known of Manitoba's early women doctors, Charlotte Ross, was not a graduate of the University of Manitoba, although in 1993 she was posthumously granted a license to practice in Manitoba by a special resolution of the Manitoba legislature.

CHARLOTTE ROSS³⁰⁰ (1843–1916), née WHITEHEAD, the daughter of railway engineer Joseph Whitehead, was born in England but was brought with at least one older sister to Montreal at age five. She received her schooling in Clinton, Ontario, about one hundred miles west of Toronto, and attended a finishing school at the Sacred Heart Convent in Montreal. At the age of eighteen she married David Ross, her father's associate in the railway construction business.

Charlotte's interest in medicine had awakened while she was taking care of her sister Mary Anne, who after a long period of illness died of tuberculosis. The family physician, Dr. Hingston, encouraged her interest, but since medical schools in Canada were not yet accepting women, she enrolled at the Woman's Medical College of Pennsylvania in Philadelphia; absences because of a miscarriage and later the birth of a daughter meant that she did not graduate until 1875. Her application for a license to practice in Quebec was refused, but she worked successfully in Montreal, without prosecution, for three years, largely because of the patronage of Dr. Hingston, later mayor of the city.

In 1878 she joined her husband and her father, who were building section 15 of the Canadian Pacific Railway, with headquarters in Whitemouth, Manitoba. Her application for a license to practice in Manitoba was refused because she declined to retrain at a Canadian medical school and then take the examination set by the admissions board of the Manitoba College of Physicians and Surgeons. Nevertheless, as the only doctor in the isolated, rural community of Whitemouth, about fifty miles east of Winnipeg, she could hardly sit by and ignore what was happening around her. Whitemouth was a railway town surrounded by rough lumber camps. Most of her patients were male, and much of her work resulted from ax injuries to the feet and legs; she not infrequently used her surgeon's skills in amputating limbs, setting broken bones, and stitching wounds. Once she amputated the leg of a homesteader injured by a falling tree, using a handsaw as he lay on his kitchen table. Fortunately this pioneer doctor was far ahead of many of her contemporaries and followed strict antiseptic procedures. She was also able to persuade the Whitemouth community to be inoculated against smallpox at a time when people

in large cities such as Montreal were still denied immunization. She practiced for twenty-seven years in all without a license, never being prosecuted in Manitoba simply because she was the only doctor in a rough, rural community; she was also a fine physician. She retired when she was about sixty, after many years of bringing medical help to people who otherwise would have had none.

Other notable women doctors were working in isolated regions of Manitoba before the turn of the century, one such being ELIZABETH BECKETT MATHESON³⁰¹ (1866–1958), wife of Anglican missionary John Matheson. Elizabeth served as medical doctor for a time to the native peoples and Métis in the then small and remote Cree reservation of Onion Lake on the Alberta-Saskatchewan border.

But the stories of these women physician's careers are like the stuff of legend, and brief summaries here would do them less than justice.

SUMMARY

Contributions of women to nineteenth- and early twentieth-century scientific work in Canada range from the plant collecting and botanical illustration begun in the 1820s to the internationally recognized studies carried out by two outstanding research scientists of the early years of the twentieth century.

The environments in which the early plant enthusiasts worked varied greatly, from the woodlands of the Maritimes to the northern tundra and the wild, high-peak country of the Rocky Mountains. Among the earliest workers two especially might be singled out: Quebec chatelaine Harriet Sheppard, one of William Hooker's collectors, and botanical artist Mary Morris of Halifax, Nova Scotia. A few decades later, after preliminary exploration of the western mountains had been carried out and the region became more accessible, a particularly colorful group came to the fore. These were the collectors and botanical artists who spent their summers exploring the land and flora of the Rockies and the Selkirks from the 1880s on; Mary Schäffer Warren and Mary Vaux Walcott were especially notable, both leaving valuable records and collections of paintings, published and unpublished. Perhaps the most captivating story of all is that of Martha Black, plant collector, botanical artist, and latterly member of Parliament for the Yukon, who first went to Dawson with the gold prospectors of the 1890s.

Access to higher education was marked in some of the larger institutions by the not-uncommon administrative reluctance to accept women into the male world of academic study. On the other hand, a number of smaller denominational institutions were coeducational from about the 1870s; schools and colleges run by Methodist communities have an especially admirable record. When women did begin to attend the larger universities in the 1880s, they gravitated for the most part to the liberal arts, especially languages, and to medical studies rather than the sciences. Arts degrees opened doors to high school teaching and administration; medical training, although considerably harder to get, could lead to valuable and much-needed work in places as different as a Cree reservation in northern Manitoba and a Canadian mission station in central India. By the turn of the century a few women were finding their way into advanced scientific studies, but the entry was still slow and difficult. Nevertheless, by the opening decades of the twentieth century, the work of cardiac disease specialist Maude Abbott of McGill University and wheat rust expert Margaret Newton of the Dominion Rust Research Laboratory was bringing to both them and their institutions recognition from the scientific community throughout North America and Europe.

NOTES

1. For fuller accounts see for instance James S. Pringle, "The history of the exploration of the vascular flora of Canada," *Canadian Field-Naturalist* 109, no. 3 (1995): 291–356. For an outline of the history of botanical exploration in Canada see Tim Dickinson, Ecology and Evolutionary Biology Department, University of Toronto, "History of botanical exploration and the development of botanical thought," http://courses.eeb.utoronto.ca/eeb337/F_Organization/307notes09a.html (Oct. 2009).

2. Hooker's flora was not the first on the plants of North America, that being the 1803 *Flora Boreali-Americana* of French botanical explorer André Michaux.

3. Many years before the arrival of Europeans in North America, the early peoples of the region had accumulated considerable knowledge of the plant life of their surroundings, and the native experts on plants having medicinal properties included women. Records also exist of at least one early French woman resident of Montreal, Catherine Jérémie, who may well be regarded as following in the role of native women herbalists, although she also has a place among the early amateur plant collectors of New France. In 1702 Catherine Jérémie (1664–1744), also known as Catherine Lamontagne, settled with her second husband in Montreal, where she practised as a midwife and became known as a plant collector. Over many years her special interest was the medicinal plants used by the native peoples of the country; the shipments of “simples” she supplied to various midwife and nursing groups in Montreal were carefully provided with notes indicating properties and effects. Along with other amateur botanists, including physicians Sarrazin and Gaultier, she helped spread knowledge of the medicinal benefits of native plants among the European settlers; in addition she provided information for the botanical section of a major work by French historian and traveler Pierre François Xavier de Charlevoix (1682–1761): *Description des plantes principales de l’Amérique septentrionale* (1744), part of *Histoire et description générale de la Nouvelle-France* (1744; English tr. 1769 by J. G. Shea). See Judith Young and Nicole Rousseau, “Lay nursing from the New France era to the end of the nineteenth century,” in *On All Frontiers: Four Centuries of Canadian Nursing*, ed. Christina Bates, Diane Elizabeth Dodd, and Nicole Rousseau (Ottawa: University of Ottawa Press, 2005), 13; Dickinson, Ecology and Evolutionary Biology Department, University of Toronto, “History of botanical exploration.”

4. Peter Burroughs, “Ramsay, George, 9th Earl of Dalhousie,” in *Dictionary of Canadian Biography*, online ed., Library and Archives Canada, updated 2005, www.biographi.ca/EN/ShowBio.asp?BioId=37707 (Jan. 2008); Pringle, “History of the exploration,” 304, and “Canadian botanical specimens collected 1826–1828 by the Countess of Dalhousie, acquired by the Royal Botanical Gardens,” *Canadian Horticultural History* 3 (1995), 1–24; Ray Desmond, *Dictionary of British and Irish Botanists and Horticulturalists, Including Plant Collectors and Botanical Artists* (London: Taylor and Francis and the Natural History Museum, 1994), 571; Mary Gunn and L. E. W. Codd, *Botanical Exploration of Southern Africa* (Cape Town: A. A. Balkema, 1981; published by the Botanical Research Institute), 126; Marie Elwood, “The discovery and repatriation of the Lord Dalhousie collection,” *Archivaria* 24 (1987): 108–16; Charles Mosley, ed., *Burke’s Peerage, Baronetage and Knightage, 107th edition* (Wilmington, Del.: Burke’s Peerage [Genealogical Books], 2003), 3 vols., 1:1019; Joseph Archibald, “Dalhousie Castle and Gardens; the botany of the neighbourhood and various remarks,” *Gardner’s Magazine* 1, no. 3 (1826): 251–58, on 255; Peter B. Waite, *The Lives of Dalhousie University. Vol. I: Lord Dalhousie’s College 1818–1925* (Montreal: McGill–Queen’s University Press, 1994).

5. The eldest of the three Dalhousie sons, George Ramsay, gained the rank of captain in the Twenty-sixth Regiment of Foot; he died in 1832 at the age of twenty-six. The second son, Charles, died in 1817, shortly before his tenth birthday. Only the youngest, James Andrew, who at the age of four had accompanied his parents to Nova Scotia, lived to a mature age and succeeded to the title of Second Baron Dalhousie and Tenth Earl Dalhousie. Educated at Harrow and Oxford University (M.A.), he held various government offices during the 1830s and 1840s and was viceroy of India from 1847 to 1856. KT (Knight, Order of the Thistle) from 1848, he was created First Marquess of Dalhousie Castle, County Edinburgh and of the Punjab in 1849 and held the office of lord warden of the Cinq Ports in 1853. Having two daughters but no male heir, his marquessate and his barony became extinct on his death in 1860 (*Burke’s Peerage*, 1:1019).

6. The collections of the Quebec society were destroyed by fires in 1854 and 1860, but other specimens collected by Lady Dalhousie still exist in Edinburgh. See Pringle, “Canadian botanical specimens,” 3.

7. Pringle, “History of the exploration,” 304.

8. Elwood, “Discovery and repatriation,” 109.

9. Pringle, “Canadian botanical specimens,” 14–16.

10. Frederick Traugott Pursh (1744–1820), a German botanist and friend of the Sheppards, botanized extensively around Montreal and Quebec, as well as in the Ottawa Valley and on Anticosti Island in the Gulf of St. Lawrence. Between his arrival in Montreal in 1816 and his death in 1820, he amassed a sizable collection of specimens, intending to write a flora of Upper and Lower Canada. Some of his specimens from this period were placed in the holdings of A. B. Lambert, his English patron at that period, but his own herbarium and his manuscripts were destroyed by fire. His two-volume *Flora Americae Septentrionalis; or A Systematic Arrangement and Description of the Plants of North America* (London: White, Cochrane & Co., 1813), the second actual flora of any major part of the continent, included descriptions of specimens brought back by the 1804–1806 Lewis and Clark transcontinental expedition to the Pacific; it followed Michaux’s *Flora* of 1803 (see note 2).

11. Archibald, “Dalhousie Castle and Gardens,” 251–58.

12. *Botanical Society of Edinburgh, Annual Report and Proceedings* 1 (1836–): 52.

13. Pierre Savard, “Sheppard, William,” in *Dictionary of Canadian Biography*, online ed., www.biographi.ca/EN/ShowBio.asp?BioId=38823 (Dec. 2007), and “Campbell, Archibald,” *Dictionary of Canadian Biography*,

online ed., www.biographi.ca/EN/ShowBio.asp?BioId=38462 (Dec. 2007); genealogical account by Dorothy May Campbell, later Poole, of “The Campbells of Quebec,” www.antonymaitland.com/campbell.htm (Feb. 2008); James S. Pringle, “Anne Mary Perceval (1790–1876), an early botanical collector in Lower Canada,” *Canadian Horticultural History* 1 (1986), 7–13.

14. The Society for the Encouragement of Arts and Sciences in Canada (Society of Arts and Science) was founded in 1827 in Quebec by military officers and civilians with interests in the liberal arts. It merged with the Literary and Historical Society of Quebec in 1829.

15. Jean Baptiste Pierre Antoine de Monet de Lamarck, *Histoire naturelle des animaux sans vertèbres*: . . . (Paris: Verdrière, 1815–1822), 7 vols.

16. Aurele La Rocque, “A neglected work on the shells of Quebec,” *Canadian Field-Naturalist* 49 (1935): 147–50, quotation on 150. La Rocque’s opinion may be relied on. An internationally respected paleontologist who specialized in mollusks, Joseph Alfred Aurele La Rocque (1909–1990) was born in Ottawa, worked with the Geological Survey of Canada, Ottawa, for many years and later taught at Ohio State University (1948–1976). He was well known also for his interests in the history of geology and with his seminar students compiled the three-volume biographic/bibliographic reference work, *Contributions to the History of Geology* (1964); see William R. Burk, “Joseph Alfred Aurele La Rocque (1909–1990),” in Ronald L. Stuckey, “Obituaries of the members of the Ohio Academy of Science, Report of the Necrology Committee, 1995,” *Ohio Journal of Science* 95, no. 5 (1995): 343–51.

17. Alexander Wilson (1766–1813), a largely self-educated Scot, trained as a weaver. Since he wrote and published poems and became active in a workers’ movement for improved political rights and economic conditions, he came under suspicion for political agitation. This resulted in his emigrating to the United States in 1794, his sister’s son William Duncan, also a weaver, accompanying him. Over the course of several years of school-teaching in communities in Pennsylvania and New Jersey, during which he took long walks across the countryside, he became increasingly interested in birds and developed the ambition of publishing a work describing and illustrating the birds of eastern North America. By 1806 he had become an assistant editor in the Philadelphia publishing firm of Samuel Bradford. With his fellow Scot, Philadelphia engraver Alexander Lawson, having agreed to engrave the plates and with Bradford willing to publish the work, Wilson hoped to bring out ten volumes with ten plates each. By the time of his death at the age of forty-seven in 1813, eight volumes had appeared; his friend George Ord completed his unfinished ninth volume. The nine-volume work with seventy-six plates was the most extensive publication of any American author. A substantial contribution to American ornithology, it went far beyond any other scientific literature on American birds available at the time; no one had ever published as many detailed studies as Wilson. See Alexander Wilson and George Ord, *American Ornithology, or, The Natural History of the Birds of the United States* . . . , 9 vols. (Philadelphia: Bradford and Inskeep, 1808–1825). Frank N. Egerton, “Wilson, Alexander (1766–1813),” in *Oxford Dictionary of National Biography*, Oxford University Press, 2004, online ed., www.oxforddnb.com/www2.lib.ku.edu.2048/view/article/29634 (Feb. 2008).

18. James Rennie, “Sketches of twenty-four American song birds,” *Magazine of Natural History* 1 (1828–1829): 414–21.

19. Pringle, “Anne Mary Perceval,” and “History of the exploration,” 304; Desmond, *British and Irish Botanists* (1994), 546.

20. John Torrey and Asa Gray, *A Flora of North America: Containing Abridged Descriptions of All Known Indigenous and Naturalized Plants Growing north of Mexico* . . . , 2 vols. (New York: Wiley and Putnam, 1838–1843).

21. James Matheson (1798–1878), partner and then head of Jardine, Matheson & Company, merchant traders with China and other countries in the Far East, bought the Isle of Lewis for £190,000 in 1844. He brought many improvements to the island and also built the ornate, Victorian-style Lews Castle on a site overlooking Stornoway harbor. Matheson’s company, founded in 1832, is now a large conglomerate.

22. Michael A. Peterman, “Strickland, Catharine Parr (Traill),” in *Dictionary of Canadian Biography*, online ed., www.biographi.ca/EN/ShowBio.asp?BioId=40570 (Dec. 2007); Elizabeth MacCallum, “Catharine Parr Traill; a nineteenth-century Ontario naturalist,” *Beaver* (Autumn 1975): 39–45; P. M. Catling, V. R. Catling, and S. M. McKay-Kuja, “The extent, floristic composition and maintenance of the Rice Lake Plains, Ontario, based on historical records,” *Canadian Field-Naturalist* 106 (1992): 73–86; William G. Dore, “Grasses from Stony Lake gathered and mounted by Cath[e] Parr Traill—aged 92,” *Ontario Naturalist* 4, no. 2 (1966): 17–21; Pringle, “History of the exploration,” 307–8; Library and Archives, Canada, “Natural environment: Susanna Moodie and Catharine Parr Traill,” www.collectionscanada.gc.ca/moodie-traill/027013-3400e.html updated 2001 (Jan. 2008); Carl P. A. Ballstadt, “Strickland, Susanna (Moodie),” in *Dictionary of Canadian Biography*, online ed., www.biographi.ca/EN/ShowBio.asp?BioId=39976 (Jan. 2008); Anon., obituary, *Journal of Botany* 37 (1899): 448; Judith Johnson, “‘Women’s testimony’: imperialist discourse in the professional and colonial travel writing

of Louisa Anne Meredith and Catharine Parr Traill,” *Australian and New Zealand Studies in Canada* 11 (June 1994): 34–55—an essay in literary criticism that has little to add to the understanding of Traill’s contributions to Canadian nineteenth-century botanical science.

23. Elizabeth Strickland (1794–1875) and her sister Agnes (1796–1874), the two eldest daughters, were popular historians, Agnes becoming widely celebrated in her time for her studies of royal women, works to which Elizabeth contributed substantially. Their best-known publication, the nine-volume *Lives of the Queens of England* (1840–1848), published under Agnes’s name only, and to a lesser extent the two-volume *Lives of the Queens of Scotland* (1850) were among the most popular of all Victorian historical publications. Although their works fell out of fashion in the early 1900s, the rise of interest in the last two decades of the twentieth century in women’s roles in the writing of recent history resulted in the reinstatement of the elder Strickland sisters as notable female historians writing about women. The youngest of the six Strickland sisters, Susanna, who in 1832 emigrated with her husband John Dunbar Moodie to Canada, also became a well-known writer. In her most important work, her two-volume *Roughing it in the Bush*, published in London in 1852, she wrote at length about the natural world around her; hers was a romantic view of nature, in contrast to Catharine’s more scientific approach. See Rosemary Mitchell, “Strickland, Agnes (1796–1874),” in *Oxford Dictionary of National Biography*, 2004, online ed., www.oxforddnb.com.www2.lib.ku.edu:2048/view/article/26663 (April 2008); Ballstadt, “Strickland, Susanna (Moodie),” in *Dictionary of Canadian Biography*, online ed., www.biographi.ca/EN/ShowBio.asp?Biold=39976 (Nov. 2009).

24. Catharine Parr Strickland and Joseph Rickerby (printer), *Sketch Book of a Young Naturalist, or, Hints to the Students of Nature* (London: Harvey and Darton, 1831).

25. See Catling, Catling, and McKay-Kuja, “Extent, floristic composition and maintenance.”

26. Catharine Parr Traill, *The Backwoods of Canada: Being Letters from the Wife of an Emigrant Officer, illustrative of the Domestic Economy of British America*, 2 vols. (London: Charles Knight, 1836), and at least 8 later editions in the 1830s and 1840s, including a French tr., *Les forêts intérieures du Canada: lettres écrites par la femme d’un officier émigrant sur la vie domestique des colons Américains* (Paris: L. Curmer, 1843), 140 pp.; reprint Toronto: MacClelland and Stewart, 1989, 301 pp. Quotations from 61, 62 (1836 ed.). Catharine Traill later identified deer grass as *Sorgum nutans*, now *Sorghastrum nutans*, and *Andropogon fructus*, now *Andropogon gerardii* (see Catling, Catling, and McKay-Kuja, “Extent, floristic composition and maintenance,” 82). *Backwoods of Canada* is also of considerable interest to the general reader, being the story of a long and somewhat hazardous journey and gradual adaptation to life in a very different world, all told in a familiar style as a series of letters home. Writing for a British audience, and particularly for potential emigrants, Traill included careful warnings that conditions like those described by writers of emigration booklets are achieved only after “long years of unremitting labour” that for women included such work as weaving cloth, establishing a dairy, keeping chickens, and making all necessities, from clothes to soft soap. Immigration was not for the delicate or fainthearted. But she also made clear the rewards and satisfactions of the settler’s life and her own keen enjoyment of Canada’s natural world in all the seasons, a world she describes very ably, despite her strongly professed regret at having earlier turned aside offered instruction in botany and flower painting. Among her especially interesting passages is, for example, an account of the spectacular process of burning off an area recently cleared of the native forest cover and the predictable succession of plant cover that followed, namely fireweed, sumac bushes, and wild raspberries and gooseberries, with a ground carpet of wild strawberries.

27. Catharine Parr Traill and Agnes Dunbar Fitzgibbon (illustrator), *Canadian Wild Flowers* (Montreal: John Lovell, 1868); reprint Almonte, Ontario: Algrove Publishing, 2003.

28. A scanned version of Traill and Fitzgibbon, *Canadian Wild Flowers* (1868), is online at www.gutenberg.ca/ebooks/traill-wild/traill-wild-00-h-dir/traill-wild-00-h.html (April 2009).

29. See note 10.

30. Dickinson, Ecology and Evolutionary Biology Department, University of Toronto, “History of botanical exploration.”

31. Catharine Parr Traill and Agnes Dunbar Chamberlin (illustrator), *Studies of Plant Life in Canada; or, Gleanings from Forest, Lake and Plain* (Ottawa: A. S. Woodburn, 1885), 288 pp.

32. Catharine Parr Traill, *Pearls and Pebbles; or, Notes of an Old Naturalist* (Toronto: William Briggs, 1894).

33. Sandford Fleming (1827–1915), famous as the surveyor of most of the Canadian Pacific Railway as well as the Intercolonial Railway, had strong connections with Peterborough, his first Canadian home after he and his elder brother emigrated from Scotland in 1845. He may well have met Catharine Traill about that time; he was not a naturalist, but he greatly enjoyed the outdoor aspects of his profession. A man of tremendous vitality and drive, with wide scientific interests, he is especially noteworthy for having introduced the idea of universal standard time and standard time zones, a system he promoted at major international conferences throughout the 1880s. He was one of the founding members of the Royal Society of Canada and founder of the Toronto-based

Royal Canadian Institute; in 1880, following his retirement from surveying, he became chancellor of Queen's University, Kingston.

34. See Dore, "Grasses from Stony Lake," and "Exhibits 2001–2002 in the W. D. Jordan Library, Queen's University, Kingston, Ont.," revised March 2003, <http://library.queensu.ca/webmus/sc/exhibitsarch1.html> (May 2008).

35. See Trent University website, www.trentu.ca/admin/colleges/traill.html (April 2009).

36. James S. Pringle, "Botanical exploration of the Canadian watershed of Lake Huron during the nineteenth century," *Canadian Horticultural History* 2 (1989): 4–88, on 22–27, portr. 36; Howard A. Crum, "Bryophytes of Owen Sound and the Bruce Peninsula, Ontario," *Bulletin (National Museum of Canada)*, no. 216, Biological Series 76 (1966): 102–22; Barbara M. Thiers and K. Stacy Giles Emory, "The history of bryology in California," *Bryologist* 95, no. 1 (1992): 68–72; C. F. Austin, "Bryological Notes," *Botanical Gazette* 2, no. 8 (1877): 110–12; Anon, obituary "Death of William Roy, Esq.," *Owen Sound Advertiser* 33, no. 1673, S-weekly, 5, no. 428, 1 March 1895, 1; Robert Burnet, "President's Address, 1874," *Report of the Fruit Growers' Association of Ontario for the year 1874* (1874): 4–11, on 8, 9.

37. Burnet, "President's Address," 9.

38. Daniel Cady Eaton, *The Ferns of North America*, 2 vols., colored illustrations by James Henry Emerton and Charles Edward Faxon (Salem, Mass.: S. E. Cassino, issued in parts 1877–1880). The outstanding illustrations prepared by Emerton and Faxon are now collectors' items. Emerton, an arachnologist, and Faxon, from 1882 director of the Arnold Arboretum, Boston, were both well known as natural history illustrators, Faxon particularly for his contributions to works on trees of North America. See also Pringle, "Botanical exploration," 37, for a reproduction of Faxon's painting of *Dryopteris filix-mas* (L) from a specimen collected by Jessie Roy.

39. D. Murphy and D. Synnott, "Fern Collections from Colonial Exhibition 1886 in the National Botanic Gardens, Glasnevin," *Glasra* 3 (1979): 1–8.

40. S. E. Cassino, ed., *The Naturalists' Directory for 1880* (Boston: S. E. Cassino, 1880).

41. See A. A. (Adele) Crowder, "The collection of bryophytes in the Fowler Herbarium, Queen's University, Kingston, Ontario," *Canadian Field-Naturalist* 88 (1974): 47–55.

42. See I. H[ettie] Vegter, *Index Herbariorum: A guide to the location and contents of the world's public herbaria, Part II (5): Collectors N-R*, in *Regnum Vegetabile* 109 (1983): 577–803.

43. Suzanne Zeller, "Lawson, George," in *Dictionary of Canadian Biography*, online ed., www.biographi.ca/EN/ShowBio.asp?BioId=40344 (April 2009); J. T. H. Connor, "To promote the cause of science: George Lawson and the Botanical Society of Canada, 1860–1863," *Scientia Canadensis* 10 (1986): 3–33.

44. Connor, "To promote the cause of science," 27–28, note 35.

45. James Hubbert, "The Entomological Society of Canada," *Canadian Journal of Industry, Science and Art* n.s. 9 (1864): 282–84 on 284; J. T. H. Connor, "Of butterfly nets and beetle bottles: the Entomological Society of Canada, 1863–1960," *HSTC Bulletin: Quarterly Newsletter of the History of Science and Technology of Canada* 6, no. 3 (1982): 151–71, on 154.

46. See Mary R. S. Creese, *Ladies in the Laboratory II: West European Women in Science, 1800–1900* (Lanham, Md.: Scarecrow Press, 2004), 72–73, 242, for a note on the joint work on silkworm culture of Cora Millet-Robinet, carried out under the auspices of the Société d'Agriculture de Poitiers, département Vienne, in 1840.

47. Connor, "To promote the cause of science," 16.

48. Edwinna von Baeyer, "Jack, Annie L.," in *Canadian Encyclopedia*, online ed., www.thecanadianencyclopedia.com/index.cfm?PgNm=TCE&Params=A1ARTA0004081 (April 2009); Paulette M. Chaisson, "Hayr, Annie Linda," in *Dictionary of Canadian Biography*, online ed., www.biographi.ca/EN/ShowBioPrintable.asp?BioId=41551 (Feb. 2008), and "Putting Chateauguay on the map: The writings of Annie L. Jack," *Chateauguay Valley Historical Society Annual Journal* 39 (2006): 17–26.

49. Chaisson, "Putting Chateauguay on the map," 18, note 5.

50. C. S. Bethune, William Saunders, and E. B. Reed, "First Annual Report of the Noxious Insects of the Province of Ontario," *Annual Reports 1870–75 Fruit Growers and Entomological Society* (Toronto, 1871).

51. Connor, "Of butterfly nets and beetle bottles," 160.

52. *Canadian Entomologist* 12 (Dec. 1875): 242–44.

53. L. H. Bailey, "Originality in gardens," *Garden Magazine* (New York) 1, no. 1 (February 1905): 17; L. H. Bailey, ed., *The Standard Cyclopaedia of Horticulture*, 3 vols., new ed., (New York: Macmillan, 1914).

54. Annie L. Jack, *The Little Organist of St. Jerome; and Other Stories of Work and Experience* (Toronto: William Briggs, 1902), 91 pp.; *Rhyme-thoughts for a Canadian Year* (Toronto: William Briggs, 1904), 14 leaves; *Maple Lore* (Montreal: A. T. Chapman, 1910), 22 pp.

55. John G. Jack, "Rare butterflies in Quebec," *Report of the Entomological Society of Ontario* (1883): 37. See also Kenneth Jack, "John George Jack," Internet publication, www.electricscotland.com/history/world/jack_john

.htm (Jan. 2008). John Jack traveled extensively, one of his trips being a yearlong visit to the Far East in 1905. The complex genus *Sinojackia* bears his name; at present *Sinojackia* is considered to consist of eight species, all endemic to China and all now classed as endangered. (See Xiaohon Yao, Qigang Ye, Peter W. Fritsch, Boni C. Cruz, and Hongwen Huang, "Phylogeny of *Sinojackii* (Styracaceae) based on DNA sequence and microsatellite data . . .," *Annals of Botany* 101 (2008): 651–59). Among the ten other plant species, hybrids, or varieties of trees and shrubs named after John Jack are *Quercus jackii* Schneid, *Viburnum jackii* Rehd, and *Betula jackii* Schneid.

56. S. Lynne Campbell and Susan L. Bennett, "Harvey, Eliza Maria (Jones)," in *Dictionary of Canadian Biography*, online ed., www.biographi.ca/009004-119.01-e.php?&id_nbr=6773 (April 2009); E. M. Jones, *Dairying for Profit: or, the Poor Man's Cow* (New York: Judd, 1892; Montreal: J. Lovell, 1892, 1894; Brockville: s.n., 1893; Chicago: Baldwin, Ross, 1893; New York: Charles M. Nicoll, 1896), French tr., *Laiterie payante, ou, la vache du pauvre* (Trois-Rivières, Quebec: [s.n.], 1894), available online, <http://canadiana.org/ECO/PageView/47461> (Aug. 2008); "The First Jersey Cows in Canada," <http://jersey-dk.dk/index.php?page=jersey&id=901> (Aug. 2008); "The importation of Jersey cattle to Canada 1868," from vol. 1 of the London, Ontario, serial, *The Canadian Jersey Cattle Club Record*, 1912, reproduced online, <http://jersey-dk.dk/index.php?page=jersey&id=993> (Aug. 2008); "Franklands Farm. History," www.franklandsfarm.com/history.htm (Aug. 2008).

57. Jones, *Dairying for Profit*, introduction and preface.

58. Quoted in Campbell and Bennett, "Harvey, Eliza Maria."

59. See "The importation of Jersey cattle to Canada 1868."

60. E. M. Jones, *Lecture on Co-operative Dairying and Winter Dairying* (Montreal: J. Lovell, 1893).

61. See Peter E. Rider, "Heartz, Richard Jacob," in *Dictionary of Canadian Biography*, online ed., www.biographi.ca/009004-119.01-e.php?&id_nbr=6776 (April 2009).

62. See "Franklands Farm. History."

63. John Sankey, *Enjoying the Birds of the Ottawa Valley* (Ottawa: J. Sankey, 1987, 1988), 116 pp., also online at www.sankey.ws/enjoying.html (Dec. 2007); A. G. Kingston, Gertrude Harmer, and W. T. Macoun, "Report of the ornithological branch of the Ottawa Field-Naturalists' Club for 1897–98," *Ottawa Naturalist* 12 (1898): 15–17; membership lists, Ottawa Field-Naturalists' Club, *Ottawa Naturalist*, 1890–1915.

64. Charles Bruce Fergusson, "Morris, Maria Frances Ann (Miller)," in *Dictionary of Canadian Biography*, online ed., www.biographi.ca/EN/ShowBioPrintable.asp?BioId=39297 (Jan. 2008); Janet Guilford, "Maria Morris Miller: the many functions of her art," *Atlantis* 20, no. 1 (1995), 113–23; Marie Elwood, "Miller, Maria Morris," in *Canadian Encyclopedia*, online ed., www.thecanadianencyclopedia.com/index.cfm?PgNm=TCE&Params=A1ARTA0010259 (April 2009); "Canadian Women Artists: historical sources database," http://cwahi.concordia.ca/sources/artists/displayArtist.php?ID_artist=70 (Jan. 2008); Jim Burant, "Art in Halifax: Exhibitions and criticism in 1830 and 1831," *RACAR, revue d'art canadienne, Canadian Art Review* 8, no. 2 (1981): 119–36.

65. Although not fully and permanently operational until 1863, Dalhousie College had a main building in which some classes could be offered by the 1820s.

66. Provincial art exhibitions and provincial art institutions had become increasingly popular in Britain in the opening decades of the nineteenth century, the major cause being the inability of artists to make a living in the larger metropolitan centers of London and Bath. By the 1820s the idea of working outside major centers was being taken up by artists across the Atlantic as well. See Burant, "Art in Halifax," 123.

67. Maria Morris (illustrator), *Wildflowers of Nova Scotia*, text by Titus Smith (Halifax: C. H. Belcher; London: John Snow, 1839–1840); 2nd series, with text by Alexander Forrester (Halifax: A. & W. MacKinlay; London: John Snow, 1853); 3rd series, *Wild Flowers of Nova Scotia and New Brunswick*, with text by George Lawson (Halifax: M. L. Katzman; London: John Snow, 1866); 4th series, *Wildflowers of British North America*, with text by George Lawson (London: Reeve & Co., 1867).

68. Guilford, "Maria Morris Miller," 113.

69. Guilford, "Maria Morris Miller," 121.

70. M. M. Whiting, "Early collection of plants in Prince Edward Island," *Kew Bulletin* 3, no. 2 (1948): 236; Desmond, *British and Irish Botanists* (1994), 326; "Prince Edward Island: Lieutenant Governors Gallery, The Honourable Thomas Heath Haviland, Q.C.," www.gov.pe.ca/lg/gallery/16Haviland.php3 (Jan. 2008); Anne B. Shteir, "Women and plants—a fruitful topic," *Atlantis* 6, no. 2 (1981): 114–22, on 116; William Page, ed., *The Victoria History of the County of Buckingham*, 4 vols., vol. 2 (1908), 253–55 (London: A. Constable & Co., 1905–1927), (*The Victoria History of the Counties of England* series); "The descendents of John Grubbe and Sarah Anne Carrington," www.islandregister.com/grubbe1.html (May 2008); shipping lists (4), *The Island Register*, www.islandregister.com/ship_data3.html (May 2008).

71. One of the sons who accompanied his father to Prince Edward Island, Charles Septimus Grubbe (1831–1910) had a successful career in the church in South Africa, where he became archdeacon of Pietermaritzburg. In 1861, in South Africa, he married Scottish-born Alice MacKenzie, a sister of Charles Frederick MacKenzie,

bishop of Pietermaritzburg. Natal was then going through a period of considerable turbulence, and the Grubbes may have returned to Britain by the late 1860s.

72. Membership lists for 1900–1901 and 1901–1902, *Proceedings of the Nova Scotian Institute of Science* 10 (ser. 2, 3) (1898–1902): Appendix III; A. Louise Jaggar, “Notes on the flora of Digby County, N.S.,” *Proceedings of the Nova Scotian Institute of Science* 10 (ser. 2, 3) (1898–1902): c, title only.

73. William Henry Edwards (1822–1909), president of the Ohio and Kanawha Coal Company, West Virginia, and a well-known entomologist, specialized in the study of Lepidoptera. His most important work was his *Butterflies of North America* (Philadelphia: American Entomological Society, 1868–1897), 3 vols., each in several parts, illust., with colored plates. (See Arnold Mallis, *American Entomologists* (New Brunswick, N. J.: Rutgers University Press, 1971), 288–92).

74. See Joseph Ewan and Nesta Dunn Ewan, *Biographical Dictionary of Rocky Mountain Naturalists* (Utrecht/Antwerpen: Bohn, Scheltema and Holkema; The Hague / Boston: Dr. W. Junk, 1981). Quotation from Mary T. S. Schäffer, *Old Indian Trails; Incidents of Camp and Trail Life, Covering Two Years’ Exploration of the Rocky Mountains of Canada* (New York: G. P. Putnam’s Sons, 1911), 17.

75. Ewan and Ewan, *Rocky Mountain Naturalists*, 103; Anon., obituary, “Mrs. Julia W. Henshaw,” *New York Times*, 21 November 1937, 49; Anon., death notice, *Daily Telegraph* (London), 20 November 1937, 16; Ann Innes Dagg, *The Feminine Gaze: A Canadian Compendium of Non-fiction Women Authors and Their Books, 1836–1945* (Waterloo, Ontario: Wilfred Laurier Press, 2001), 131–32; Morag Bell and Cheryl McEwan, “The admission of women fellows to the Royal Geographical Society, 1892–1914: The controversy and the outcome,” *Geographical Journal* 162, no. 3 (1996): 295–312, on 300, 303, 309 (note 6), 311; Mary Q. Innes, ed., *The Clear Spirit: Twenty Canadian Women and Their Times* (Toronto: University of Toronto Press, 1966), 172–73; Constance Brissenden in “Chronology, 1937, November 18, 1937, Julia Willmothe Henshaw,” in *The History of Metropolitan Vancouver*, <http://vancouverhistory.ca/chronology1937.htm> (May 2008); Colleen Marie Skidmore, *This Wild Spirit: Women in the Rocky Mountains of Canada* (Edmonton: University of Alberta Press, 2006), 249–56 (the work is a collection drawn largely from archival material held at the Whyte Museum of the Canadian Rockies, Banff, Alberta); Canadian Expeditionary Force Study Group: View topic—Mrs. Henshaw, www.cefresearch.com/phpBB2/view-topic.php?t=4088 (April 2009); A. O. W. (most likely Arthur O. Wheeler), “In Memoriam: Julia W. Henshaw, F.R.G.S. 1869–1937,” *Canadian Alpine Journal* 25 (1937): 128–31; Alan Twigg, “Henshaw, Julia,” in BCBOOK-WORLD/2003 (online publication, Alan Twigg, ed.), www.abcbookworld.com/view_author.php?id=2640 (May 2008). Sources differ on both Julia Henshaw’s place of birth and her middle name; some give Durham as place of birth rather than Shropshire, and some give Willmothe rather than Willmotte as her middle name.

76. Charles Grant Henshaw was the son of Joshua Henshaw of Saint-Hyacinthe, Quebec, (thirty miles east of Montreal), a land agent of the Grand Trunk Railway of Canada, now part of the Canadian National Railway. Charles Henshaw’s brother-in-law, Frederick Williams-Taylor of the Bank of Montreal, became manager of the bank’s London branch in 1906; a well-known figure in London’s financial circles for several years, he became the bank’s general manager in 1913 and was knighted the same year. See Henshaw Family Association web pages, <http://www.rawbw.com/~hinshaw/cgi-bin/id?8048> (June 2009), and *L’Encyclopédie de l’histoire du Québec*, online <http://faculty.marianopolis.edu/c.belanger/quebechistory/encyclopedia/FrederickWilliams-Taylor.html> (May 2008).

77. A. O. W., “In Memoriam,” 128.

78. Julian Durham (Julia W. Henshaw), “Vancouver, a twelve year old city,” *The Canadian Magazine* (Toronto: H. C. Maclean Publication), (December 1898): 109–14; Julian Durham, “The queen city of British Columbia,” *The Canadian Magazine* (January 1899): 207–13.

79. Julian Durham (Julia W. Henshaw), *Hypnotized? or, The Experiment of Sir Hugh Galbraith* (Toronto: Ontario Publishing Co., 1898, 1980), 285 pp; Julian Durham, *Why not Sweetheart?* (London: Unwin, 1901), 246 pp.

80. See Twigg, “Henshaw, Julia.”

81. Julia W. Henshaw, *Mountain Wildflowers of Canada: A Simple and Popular Guide to the Names and Descriptions of the Flowers that Bloom Above the Clouds* (Toronto: William Biggs, 1906; Boston: Ginn & Co., 1906); *Wild Flowers of the North American Mountains* (New York: Robert M. McBride Co., 1915, 1917).

82. Mary Schäffer Warren felt considerable resentment at Julia Henshaw’s having forestalled her by publishing shared information just a year before her own work on the subject came out; friendly relations were never restored between the two (see Twigg, “Henshaw, Julia,” and Innes, *Clear Spirit*, 172–73).

83. The very contentious question of admitting women as fellows of the Royal Geographical Society was debated over many years. Twenty-two women became fellows in 1892 and 1893, including Isabella Bird Bishop, Lilly Grove, and May French Sheldon (see Creese, *Ladies in the Laboratory?* 320–22, 323–24, 334–36). Strong opposition continued until 1913, when the doors were finally opened and 163 women elected; see Bell and McEwan, “Admission of women fellows.”

84. "Lectures to Young People," January 2, 1914, Mrs. Henshaw, "A new playground in Vancouver Island" (title only), *Geographical Journal* 43, no. 2 (1914): 212; "A new alpine area in British Columbia," *Scottish Geographical Magazine* 30 (1914): 128–32 (notes, with lengthy direct quotations, taken at Henshaw's lecture to the Royal Scottish Geographical Society, Edinburgh, and repeated in Glasgow, Dundee, and Aberdeen).

85. A. O. W., "In Memoriam," 130.

86. See *L'Encyclopédie de l'histoire du Québec*, <http://faculty.marianopolis.edu/c.belager/QuebecHistory/encyclopedia/W.GrantMorden.html> (May 2008).

87. Ewan and Ewan, *Rocky Mountain Naturalists*, 194; Mark J. Roth, "Mary Schäffer Warren: Explorer," *Canadian Woman Studies, Les cahiers de la femme* 2, no. 3 (1980): 21–24, and also in York University Online Journal System, <http://pi.library.yorku.ca/ojs/index.php/cws/article/viewfile/14291/13343> (May 2008); Stephen R. Bown and Nicky L. Brink, "Mountain woman," *Beaver* 87, no. 3 (June–July 2007): 42–46; Whyte Museum of the Canadian Rockies, "Tarry-a-while," www.whyte.org/tarry.html (May 2008); M. Deborah Bialeschki, "Mary Schäffer Warren: A Seeker of Untrodden Paths," *Leisure Challenges: Bringing People, Resources and Policy into Play*, Proceedings, Sixth Canadian Congress on Leisure Research, 9–12 May 1990; Anon., "Schäffer, Mary (1861–1939)," in Mountain People, www.peakfinder.com/people.asp?PersonsName=Schaffer%2C+Mary (Dec. 2007); for several excerpts from Schäffer's writings see Skidmore, *This Wild Spirit*.

88. See Ewan and Ewan, *Rocky Mountain Naturalists*, 30.

89. Stewardson Brown, *Alpine Flora of the Canadian Rocky Mountains* (New York and London: G. P. Putnam's Sons, 1907), 353 pp., illustrator, Mrs. Charles Schäffer. Eight of Mary Schäffer's watercolors are held in the Glenbow Archives, Sanson collection, Banff, Alberta.

90. Mary Schäffer's photograph of 12,972-foot Mount Robson west of Jasper was included in Charles E. Fay, "The Canadian Rocky Mountains," *Alpina Americana* no. 2 (1911).

91. Quotation from Schäffer as given in Roth, "Mary Schäffer Warren," 22.

92. Mary T. S. Schäffer, "Among the sources of the Saskatchewan and Athabasca rivers," *Bulletin of the Geographical Society of Philadelphia* 6, no. 2 (1908): 16–30.

93. Chaba Imne (Maligne Lake) had been seen briefly by railway surveyor Henry McLeod in 1875, but he appears to have done little more than indicate he saw it (Roth, "Mary Schäffer Warren," 23; Anon., "Schäffer, Mary," in Mountain People).

94. Mary T. S. Schäffer, *Old Indian Trails*, reprint, with foreword by Janice Sanford Beck (Victoria, B.C.: Rocky Mountain Books, 2006). See also Mary T. S. Schäffer, Mary W. Adams, and E[dward] J. Hart, *A Hunter of Peace: Mary T. S. Schäffer's Old Indian Trails . . . , Including a Previously Unpublished Account: The 1911 Expedition to Maligne Lake and a Portrait of Mary Schäffer Warren, Yahe-Weha, Mountain Woman* (Banff, Alberta: Whyte Foundation, 1980), 17. A collection of Mary Schäffer's pictures, *Untrodden Paths in the Canadian Rockies*, was brought out by the Soo Line Railroad Company (Minneapolis: Soo Line, 1910–20?), 23 pp. The United States arm of the Canadian Pacific Railway, the Soo Line, which serves Chicago and areas to the east and west, was acquired by the CP in 1888. It was previously known as the Minneapolis, St. Paul and Sault Ste. Marie Railroad.

95. Mary [Mollie] Adams also left a written record of these trips in her unpublished diary held at the Whyte Museum in Banff (M79/11). For an excerpt from this diary (pp. 31–39) see "Laggan to Maligne Lake and Tête Jaune Cache and return," (1908) in Skidmore, *This Wild Spirit*, 309–16.

96. At that time the lake and the surrounding mountains, although initially designated parkland, had been excluded from Jasper Forest Park because of the expense and difficulty of patrolling such a vast area. Public complaints from people such as Mary Schäffer and pressure from the powerful and influential railway companies, whose lines passed through some of the most spectacular alpine scenery in the world, persuaded the dominion government to protect the area. In June 1912 the boundaries of Jasper Forest Park were expanded to reincorporate Maligne Lake. The National Parks Act of 1930 formally established the current boundaries of what is now Jasper National Park. See Bown and Brink, "Mountain woman," 46 (sidebar).

97. Ewan and Ewan, *Rocky Mountain Naturalists*, 227–28; H. W. Y., "Mary Vaux Walcott," *Science* 92, no. 2391 (1940): 372–73; Samuel G. Gordon, "Memorial to George Vaux, Jr.," *Journal of the Mineralogical Society of America* 13, no. 25 (1928): 97–102; "Peaks of the Canadian Rockies. Mount Mary Vaux," www.peakfinder.com/peakfinder.ASP?PeakName=mount+mary+vaux (Jan. 2008); Britannica Online Encyclopedia, "Mary Morris Vaux Walcott," www.britannica.com/eb/article-9126016/Mary-Morris-Vaux-Walcott (May 2008); Anon., "Mrs. C. D. Walcott dies in Nova Scotia," obituary, *New York Times*, 25 August 1940, 36; Skidmore, *This Wild Spirit*, 167–69, 173–77; H. W. Y., "Mary Vaux Walcott," obituary, *Canadian Alpine Journal* 27, no. 2 (1940): 236–37; Paul Kovinick and Marian Yoshiki-Kovinick, *An Encyclopedia of Women Artists of the American West* (Austin: University of Texas Press, 1998), excerpt on Vaux online at <http://askart.com/AskART/artists/biography.aspx?artist=103109> (June 2008); for excerpts from Vaux's letters and other writings see Skidmore, *This Wild Spirit*, 195–200, 203–26, 235–38.

98. Harriton Association web page, "History," www.harritonhouse.org/history.htm (June 2008). The Harriton estate's original name of Bryn Mawr was later adopted by the town.

99. American climber Fanny Bullock Workman and her husband made three climbs of peaks in the 18,000-to-21,000-foot range in the eastern Himalayas in the summer of 1898, and her climb of 22,737-foot Pinnacle Peak in the Nun Kun in 1906 remained a world altitude record for women for twenty-eight years. Before Bullock Workman, British traveler Isabella Bird climbed 14,700-foot Long's Peak in Colorado in 1873. See Creese, *Ladies in the Laboratory?* 317–18, 320–22.

100. George Vaux Jr. and William S. Vaux Jr., "Some observations on the Illecellewaet and Asulkan glaciers of British Columbia," *Proceedings of the Academy of Natural Sciences of Philadelphia* 51, no. 1 (1899): 121–24; "Additional observations on glaciers in British Columbia," *Proceedings of the Academy of Natural Sciences of Philadelphia* 51, no. 3 (1899): 501–11; "Observations made in 1900 on glaciers in British Columbia," *Proceedings of the Academy of Natural Sciences of Philadelphia* 53, no. 1 (1901): 213–15; "Observations made in 1906 on glaciers in Alberta and British Columbia," *Proceedings of the Academy of Natural Sciences of Philadelphia* 58, no. 3 (1906): 568–79; "Observations made in 1907 on glaciers in Alberta and British Columbia," *Proceedings of the Academy of Natural Sciences of Philadelphia* 59, no. 3 (1907): 560–63.

101. Mary Vaux Walcott and George Vaux, *The Glaciers of the Canadian Rockies and Selkirks* (n.p.: n.p., 1911). Mary's name is also listed along with that of her brother George in the three Vaux photographs used by Fay in his 1911 "Canadian Rocky Mountains" (see note 90).

102. Mary Vaux Walcott, *North American Wild Flowers*, 5 vols., color plates (Washington, D.C.: Smithsonian Institution, 1925). Reissued six times between 1953 and 1993, with additional paintings by Dorothy Falcon Platt, edited, with introduction and detailed descriptions, by Harold William Rickett and retitled *Wild Flowers of America. 400 Flowers in Full Color Based on Paintings*; publishers varied, Crown Publishers, New York, bringing out the first (1953) expanded edition.

103. Mary Vaux Walcott, Edgar Theodore Wherry, and Frank Morton Jones, *Illustrations of North American Pitcherplants* (Washington, D.C.: Smithsonian Institution, 1935).

104. Being chosen to carry the flag of the Society of Woman Geographers on an expedition, i.e., becoming a "Flag-Carrier," is to receive a special honor bestowed by the society on members who carry out work that makes a permanent contribution to geographical knowledge or constitutes original scientific research. See Society of Woman Geographers website, www.iswg.org/awards.html (June 2008).

105. Ewan and Ewan, *Rocky Mountain Naturalists*, 72; information from Nancy R. Miller, University of Pennsylvania Archives; Botanical Society of Pennsylvania, *List of Members* (Pennsylvania?: Botanical Society of Pennsylvania? 1927).

106. See Emanuel D. Rudolph, "Women who studied plants in the pre-twentieth century United States and Canada," *Taxon* 39, no. 2 (1990): 151–205, on 167.

107. Although women were still ineligible for regular undergraduate degrees at the University of Pennsylvania, they were accepted for studies in the biology department, where a few proceeded on to advanced work. See Creese, *Ladies in the Laboratory?* 7–8, for sketches of Philadelphia botanists and teachers Adeline Schively and Lucy Williams Wilson, both of whom studied biology at the University of Pennsylvania and both of whom were awarded Ph.D. degrees in 1897.

108. Olive S. Day (fl. 1904–1936), collected in the Seychelles (Indian Ocean) and in Alberta and British Columbia. Some of her collections are at the Missouri Botanical Garden Herbarium and at the New York Botanical Garden Herbarium. See www.aluka.org/action/showMetadata?doi=10.5555/AL.AP.PERSON.BM000038520 (April 2009).

109. Edith M. Farr, "Notes on some interesting British Columbian plants," *Contributions from the Botanical Laboratory of the University of Pennsylvania* 2, no. 3 (1904): 417–25, quotation on 417.

110. Edith M. Farr, "Some new plants from the Canadian Rockies and Selkirks," *Ottawa Naturalist* 20 (1906): 105–11; "Contributions to a catalogue of the flora of the Canadian Rocky Mountains and the Selkirk Range," *Contributions from the Botanical Laboratory of the University of Pennsylvania* 3, no. 1 (1907): 88 pp.

111. Carlton R. Ball, *University of California Publications in Botany* 17 (1934): 406–9, quotation on 406.

112. Ball, *Publications in Botany*.

113. Merna Foster, "The Lens of a Lady: Geraldine Moodie 1854–1945," in Merna Foster, *100 Canadian Heroines: Famous and Forgotten Faces* (Toronto: Dundurn Group, 2004), 184–86; Donny White, *In Search of Geraldine Moodie*, illust. (Regina, Sask.: Canadian Plains Research Center, University of Regina, 1998). See also Donny White, *Geraldine Moodie: An Inventory* (Regina: Canadian Plains Research Center, University of Regina, 1999), a reference book providing specific information about Moodie's work. For a review of White's 1998 book as seen from a late twentieth-century feminist angle, see Sherry Newman in *Achivaria* 48 (1999): 227–30. See also two pages on Moodie's work in the Canadian Woman Studies website in York University Digital Journals, <http://pi.library.yorku.ca/ojs/index.php/cws/article/viewFile/14287/13339> (Nov. 2009).

114. The Cree uprisings of 1884 and 1885 and the Métis resistance of 1885, which plunged the Saskatchewan District of the Northwest Territories into turmoil, were the last military conflicts on Canadian soil. The Métis, people of mixed French and First Nations background, had settled along the banks of the South Saskatchewan River after being displaced earlier from their lands along the Red River in Manitoba; by 1885 they were once again facing the loss of their lands to white settlers. Their defeat at their headquarters at Batoche, central Saskatchewan, where one of their leaders, Louis Riel, had set up a provisional Métis government, marked the end of their struggle to be recognized as a distinct people. For the First Nations people, principally the Cree, the 1885 uprisings resulted from the Canadian government's failure to abide by earlier treaty agreements. Throughout the 1885 campaigns Cree forces often outmanoeuvred the Canadian militia and Mounted Police units opposing them, and battles were inconclusive or essentially defeats for the Canadians. Superior militia troop numbers finally led to the surrender of the Cree, who were then relegated to reserves. See Stewart Mein, "North-West resistance," in *The Encyclopedia of Saskatchewan*, online ed., http://esask.uregina.ca/entry/north-west_resistance.html (April 2008).

115. Mrs. George Black, *My Seventy Years* (London, New York: Thomas Nelson, 1938), 317 pp., and Mrs. George Black, *My Ninety Years*, illustrated, updated and edited by Florence Whyard (Anchorage: Alaska Northwest Publishing, 1976); Flo Whyard, ed., *Martha Black: Her Story from the Dawson Gold Fields to the Halls of Parliament* (Portland, Ore.: Alaska Northwest Books, 1998), 3rd ed., 190 pp.; Ewan and Ewan, *Rocky Mountain Naturalists*, 21; A. Erling Porsild, "History of botanical exploration in the Yukon," in "Botany of southeastern Yukon adjacent to the Canol Road," Canada, Department of Resources and Development. National Museum of Canada Bulletin no. 121 (1951): 21–26, <http://heritageyukon.ca/Publications/Coates83.aspx> (Sept. 2008); University of Waterloo, Archives and Rare Books, Martha Louise Black fonds—1923–1965, "Black, Martha Louise, 1866–1957," www.lib.uwaterloo.ca/discipline/SpecColl/archives/black.html (Aug. 2008); Florence Whyard, "Martha Louise Black OBE. 1866–1957," www.hougens.com/yukonHistory/facts_year/1960s.aspx?year60=1965 (Aug. 2008); Wendy Elliott, "Martha Black, 2nd woman M.P.," Canadian History, http://canadianhistory.suite101.com/article.cfm/martha_black_2nd_woman_mp (Aug. 2008); Margaret Carter, "Black, Martha Louise," in *The Canadian Encyclopedia*, www.thecanadianencyclopedia.com/index.cfm?PgNm=TCE&Params=A1ARTA0000794 (April 2009).

116. See also notes on Hull House in the sketch of Alice Hamilton in Creese, *Ladies in the Laboratory?* 139–41.

117. The sizable gold deposits in the Yukon River valley were known to the Hudson's Bay Company by the 1850s, but the information was successfully suppressed because the company did not want disruption of its very profitable fur trade in this region. See Kenneth S. Coates, "Protecting the monopoly: The Hudson Bay Company and contemporary knowledge of the far North West, 1830–1869," (paper presented at *Yukon Historical Museums Association, 6th Annual Fall Conference*, 30 September–2 October 1983).

118. "Meetings: Royal Geographical Society: Session 1916–1917," Mrs. George Black elected to fellowship, 18 June 1917, *Geographical Journal* 50, (July–December 1917): 157.

119. Porsild, "History of botanical exploration," 25.

120. Eric Hultén, "History of botanical exploration in Alaska and Yukon Territories from the time of their discovery to 1940," *Meddelanden från Lunds Botaniska Museum* nr. 50 (1940): 289–346, and *Flora of Alaska and Yukon* (Lund: Gleerup, 1941–1950), 10 vols.

121. Reproductions of these works by Martha Black can be accessed at Virtual Museum of Canada Image Gallery, www.virtualmuseum.ca/English/Gallery/index.html (April 2009).

122. Mrs. George Black, *Yukon Wild Flowers* (Vancouver, B.C.: Price, Templeton, 1940s), 95 pp., illus.; George Black and Martha Louise Black, *Memories of a Yukon Summer* (n.p.: The authors?, 1940s), 20 pp., illus.; Martha Louise Black, *Klondike Days* (n.p.: Acme Press, 1940–1949?; Whitehorse: Black, Acme Press, 1954), 38 pp. The many other booklets she wrote include *Two Royal Elizabeths* and *My First Christmas Memory*.

123. Yukon Department of Tourism and Culture, Yukon Archives, Whitehorse, Frederick and Sybil Collins Collection, PHO 066, www.tc.gov.yu.ca/archives/findingaids/caption_list_82_440.pdf (Nov. 2009). A search of the records lists of CP archives did not uncover any references to holdings concerning Martha Black; I thank Jo Colby, CP Archives, Montreal, for her help with this.

124. Ewan and Ewan, *Rocky Mountain Naturalists*, 187; Rootsweb, Metisgen-L archives, <http://archiver.rootsweb.ancestry.com/th/read/METISGEN/2002-04/1019677532> (June 2008); Hartwell Bowsfield, "Ross, Bernard Rogan," in *Dictionary of Canadian Biography*, online ed., <http://biographi.ca/EN/ShowBio.asp?BioId=39362> (April 2009); "The Collectors of the NMS Athapaskan Collection," in an online report by the Prince of Wales Northern Heritage Centre, Yellowknife, for the National Museums of Scotland exhibit "Extremes: Life in Subarctic Canada," shown in both Canada and Scotland (Edinburgh), <http://pwnhc.learnnet.nt.ca/nmsathcoll/TheCollectors.html> (June 2008); F. M. Brown, "Correspondence," in *Journal of the New York Entomological Society* 66 (1958): 210 note 44, 213 note 54 and various mentions throughout the correspondence section; J. M. Sherck, "H.B.C. Pioneers: Bernard Rogan Ross (1827–1874)," *Beaver* no. 257 (December 1926): 25.

125. See note 73.
126. Bernard Rogan Ross is remembered more for his work in natural history and ethnology than as a fur trader. A foundation member of the Anthropological Society, which he joined in 1863, he became a fellow of the Royal Geographical Society the following year; for periods in 1861 he was in regular correspondence with the Academy of Natural Sciences in Philadelphia and the Natural History Society of Montreal. He published several papers in the early 1860s, mainly in the *Canadian Naturalist*. The collections of birds, insects, mammals, and Northern Athapaskan and Inuit artefacts he supplied to major institutions constituted a valuable contribution to the early scientific knowledge of the Canadian Northwest. Bernard Ross died in Toronto in 1874. Ross's goose (*Chen rossii*), a small white goose with black wingtips, a miniature version of the commoner snow goose, bears his name.
127. John MacDonald, *The Arctic Sky: Inuit Astronomy, Star Lore, and Legend* (Toronto: Royal Ontario Museum, 1998).
128. J. Rod Vickers, "Medicine wheels: A mystery in stone," *Alberta Past* 8, no. 3 (Winter 1992–1993): 6–7; Diane Brooks, "The astronomy of native Americans," *Royal Astronomical Society of Canada, Bulletin* (December 1995): 5, 7.
129. "The first astronomical observations in Canada," http://astro-canada.ca/_en/a2101.html (Dec. 2007).
130. See Creese, *Ladies in the Laboratory?* 237–41.
131. Albert D. Watson, "Astronomy in Canada," *Journal of the Royal Astronomical Society of Canada* 11, no. 2 (1917): 46–78; Helen Sawyer Hogg, "Early days of astronomy at Toronto—Part I: The Toronto Astronomical Club," *Journal of the Royal Astronomical Society of Canada* 75, no. 6 (1981): 281–88, and "Early days of astronomy at Toronto—Part II: The *Canadian Journal* and the activities of the Toronto Astronomical Club and Society 1868–1869," *Journal of the Royal Astronomical Society of Canada* 76, no. 1 (1982): 26–34.
132. V. A. Hughes, "The early history of astronomy at Queen's University," *ecass*, online journal of the Canadian Astronomical Society, no. 108, 2001, www.casca.ca/ecass/issues/2001-me/features/queens/astphys.html (Dec. 2007); Margaret Cohoe, "The observatory in City Park 1855–1880," *Historic Kingston* 27 (1979): 78–91; *Queen's Encyclopedia*, Section W, "Women at Queen's, admission of," online, <http://qnc.queensu.ca/Encyclopedia/w.html> (Dec. 2007).
133. J. E. Kennedy, "The development of astronomy in Fredericton, New Brunswick, between 1847 and 1876," *Journal of the Royal Astronomical Society of Canada* 70, no. 5 (1976): 238–46.
134. See Creese, *Ladies in the Laboratory?* 187–88. Ellen Hayes had a special interest in applied mathematics; her courses included mathematical physics and mathematical astronomy, and her original work included orbital calculations.
135. Robert S. Ball, *The Cause of an Ice Age* (London: Kegan Paul, Trench, Trübner & Co., 1891; New York: Appleton and Co., 1891, and later editions).
136. Alice Porter, "The mean distance of the Earth," *Science* 21, no. 539 (1893): 302–3.
137. Ellen Hayes, "Sun-heat and orbital eccentricity," *Science* 21, no. 534 (1893): 227–28.
138. Ellen Hayes' preferred method of evaluating the mean distance of the Earth from the Sun as a function of time gave $r_0 = a^4 \sqrt{1 - e^2}$ where a is half the major axis and e the eccentricity. Keeping in mind that
- $$a > r_0 > a\sqrt{1 - e^2} = b,$$
- where b is half the minor axis and, using the fourth root in the binomial series while limiting the range of orbital eccentricity to values thought physically possible, she showed that her value for the mean, r_0 , can be considered a close approximation of a .
139. Ellen Hayes, "Mean values," *Science* 21, no. 541 (16 June 1893): 333.
140. Robin S. Harris, *A History of Higher Education in Canada 1663–1960* (Toronto, Buffalo: University of Toronto Press, 1976); Martin L. Friedland, *The University of Toronto: A History* (Toronto, Buffalo: University of Toronto Press, 2002); Waite, *The Lives of Dalhousie*; online summaries of college histories for most of the colleges mentioned here.
141. Margaret Gillett, *We Walked Very Warily: A History of Women at McGill* (Montreal: Eden Press Women's Publications, 1981); Grace Ritchie England, "The entrance of women to McGill," *McGill News* (December 1934), 13–17.
142. Gillett, *We Walked Very Warily*, and "Ritchie, Octavia Grace," in *The Canadian Encyclopedia* online, www.thecanadianencyclopedia.ca/index.cfm?PgNm=TCE&Params=A1ARTA0006850 (Nov. 2009); Anon., "Dr. Octavia 'Grace' Ritchie," in *Canadian Men and Women of the Time: 1912*, ed. Henry James Morgan (Toronto: William Briggs, 1912), online at www.rootsweb.ancestry.com/~w/RitchieOGrace.html (July 2008); Anon., "Dr. Octavia Grace Ritchie England," *Quebec History Encyclopedia*, online at <http://faculty.marianopolis.edu/c.belanger/quebechistory/encyclopedia/OctaviaGraceRitchieEngland.html> (April 2009).

143. International Council of Women, *Health of Nations, compiled from special reports of the National Councils of Women . . .*, ed. Maria M. Ogilvie Gordon (Aberdeen: Rosemont Press, 1909; London: Constable & Co., 1910). For a sketch of Ogilvie Gordon's life and work see Creese, *Ladies in the Laboratory?* 294–96.
144. Gillett, *We Walked Very Warily*, 107–8; Register of the University of Zurich 1833–1924, version from 7 Nov. 2007, www.matrikel.uzh.ch/pages387.htm#10018 (April 2009).
145. Harris, *Higher Education in Canada*, 135.
146. George Berkeley, *An essay towards a new theory of vision . . .* (1709–1733).
147. Donald McFee, “Berkeley's neue Theorie des Sehens und ihre Weiterentwicklung in der englischen Associationschule und in der modern empirischen Schule in Deutschland,” inaugural dissertation, Zurich University (Zurich: F. Schulthess, 1895), 118 pp.
148. Gillett, *We Walked Very Warily*, and “The lonely heart: Maude E. Abbott, 1869–1940,” in *Lone Voyagers: Academic Women in Coeducational Universities, 1870–1937*, ed. Geraldine Jonchiff Clifford (New York: Feminist Press at the City University of New York, 1989), 185–224, and “The heart of the matter: Maude E. Abbott, 1869–1940,” in *Despite the Odds: Essays on Canadian Women and Science*, ed. Marianne Gosztonyi Ainley (Montreal: Véhicule Press, 1990), 179–94; Charles G. Roland, “Maude Abbott and J. B. MacCallum: Canadian cardiac pioneers,” *Chest* 57 (1970): 371–77; Charlotte Ferencz, “Maude E. Abbott—physician and scientist of international fame,” *Canadian Journal of Cardiology* 16, no. 7 (2000): 889–92; Susan Kelen, “Maude Abbott: A biography,” *Canadian Journal of Cardiology* 16, no. 7 (2000): 893–98; Anon., “Maude Abbott 1869–,” *Canadian Who's Who 1936–1937*; Anon., “Maude Abbott (1869–1940): Physician,” National Library of Canada, Canadian Women in Science, www.collectionscanada.gc.ca/women/002026-401-e.html (April 2009); McGill Medical Museum web page, Highlights of the Museum, www.mcgill.ca/medicalmuseum/introduction/ (May 2009); Register of the University of Zurich 1833–1924, version from 7 Nov. 2007, www.matrikel.uzh.ch/pages/825.htm#10647 (April 2009); M. J. S., “Maude Elizabeth Seymour Abbott, 1869–1940,” obituary, *Journal of Pathology and Bacteriology* 52, no. 3 (1941): 387–90; C[harles] F. M[artin], “Maude Abbott—An appreciation,” *Journal of Pathology and Bacteriology* 52, no. 3 (1941): 390–93, followed by “Bibliography of Maude E. Abbott,” 394–400; Maude E. Abbott, “Autobiographical sketch,” *McGill Medical Journal* 28, no. 3 (1959): 127–52 (from ms. dated 31 March 1928).
149. Maude E. Abbott, “Autobiographical sketch,” 138.
150. Maude E. Abbott, “On the classification of museum specimens: With an exposition of a decimal classification of museum specimens applied in the pathological museum of McGill University, after a plan suggested by the late Professor Wyatt Johnston,” *American Medicine* 5 (1903): 541–44; “The classification of specimens in the medical museum of McGill University,” *Bulletin of the International Association of Medical Museums* 4 (1913): 23–26; “The Wyatt Johnston descriptive classification of museum specimens, as applied in the pathological museum of McGill University,” *Bulletin of the International Association of Medical Museums* 11 (1925): 78–89.
151. Maude E. Abbott, “The museum in medical teaching,” *Journal of the American Medical Association* 44 (1905): 935–39.
152. Letter from Osler to Abbott, 23 January 1908, quoted in Abbott, “Autobiographical sketch,” 146.
153. Maude E. Abbott, “Congenital cardiac disease,” in *Modern Medicine, Its Theory and Practice, in Original Contributions by American and Foreign Authors*, 6 vols., ed. William Osler and Thomas McCrae (Philadelphia: Lea & Febiger, 1908), vol. 4, 323–425, 2nd ed. 1915, 323–448, 3rd ed. 1927, 612–812.
154. Roland, “Maude Abbott,” 373. One of the early surgical procedures stemming from Maude Abbott's standard classification system was the operation to cure “blue baby” syndrome, developed at Johns Hopkins Hospital Cardiac Clinic not long after Abbott's death. See Helen B. Taussig and Alfred Blalock, “The surgical treatment of malformations of the heart in which there is pulmonary stenosis or pulmonary atresia,” *Journal of the American Medical Association* 128 (1945): 189–202.
155. Maude E. Abbott, *Historical Sketch of the Medical Faculty of McGill University*, (Montreal: McGill University, 1902), reprinted from *Montreal Medical Journal* 31 (1902): 561–672; *History of Medicine in the Province of Quebec* (Montreal: McGill University, 1931), reprinted with additions from William Wood, ed. in chief, *The Storied Province of Quebec: Past and Present*, 5 vols. (Toronto: Dominion Publishing, 1931–1932), vol. 2, 1066–150; “Florence Nightingale as seen in her portraits, with a sketch of her life, and an account of her relation to the origin of the Red Cross Society,” *Boston Medical and Surgical Journal* 175 (1916): 361–67, 413–22, 453–57 [transcript of a lecture delivered to the Harvard Historical Society, 1915]; “Lectures on the history of nursing, with descriptive list of lantern slides. Part I. Lectures 1–9,” (Montreal: s.n., 1924), reprinted from the *Canadian Nurse*; “Women in medicine,” *University Magazine*, 1911.
156. Maude E. Abbott, managing ed., “Sir William Osler; memorial number, appreciations and reminiscences,” *Bulletin of the International Association of Medical Museums* 9 (1926), Montreal, and privately issued (Toronto: Murray Print Co., 1926, reprinted 1927). “Part I. Scientific and practical” was issued separately in 1922 as vol. 8 of the *Bulletin*.

157. Maude Abbott's life was not free from financial strains. She was the sole supporter of her sister Alice for forty years, Alice having suffered from manic-depressive psychosis from the late 1890s.

158. Maude E. Abbott, *Atlas of Congenital Cardiac Disease* (New York: American Heart Association, 1936), foreword Paul D. White; facsimile issue of original ed., 1954; new edition, with an introduction by Richard Fraser (Montreal: McGill-Queen's University Press for the International Academy of Pathology, 2006).

159. Maude E. Abbott, "The McGill University Exhibit: Development of the heart and the clinical classification of congenital heart disease," *British Medical Journal* 2 (1932): 1197–99; abstract in *Journal of Technical Methods* 13 (1934), 119–20. The exhibit was also shown at a joint meeting of the American and Canadian Medical Associations in Atlantic City in 1935 and before the Ontario Medical Association in 1936.

160. Charles D. Marple, introduction, in Abbott, *Atlas of Congenital Cardiac Disease*, facsimile issue, 1954.

161. Ignacio Chávez, *Diego Rivera: Sus Frescos en el Instituto Nacional de Cardiología* (Mexico: National Institute of Cardiology, 1946).

162. See Carl von Rokitanski, *Die Defekte der Scheidewände des Herzens* (Wien: Wilhelm Braumüller, 1875).

163. Roland, "Maude Abbott," 376. The McGill pathological museum specimen collection was gradually reduced after Maude Abbott's death, the last teaching specimens being moved to storage in the Pathological Institute basement in 1996. In 2005 an exhibit of restored specimens was mounted at the McGill Osler Library, and in 2006 a McGill Medical Museum exhibit was shown at the twenty-sixth International Academy of Pathology congress in Montreal. See McGill Medical Museum web page, www.mcgill.ca/medicalmuseum (May 2009).

164. Gillett, *We Walked Very Warily*, 340–42, and "Binmore, Elizabeth," in *Dictionary of Canadian Biography*, online ed., www.biographi.ca/009004-119.01-e.php?BioId=41332 (May 2009); Anon., "Elizabeth Binmore," in *Canadian Men and Women of the Time*, 1912, online at www.rootsweb.ancestry.com/~qcmntl-w/BinmoreElizabeth.html (July 2008); 1881 Canadian Census, Saint-Antoine Ward, Montreal, Family History Library Film 1375855, entry for Mary Binmore.

165. Robert Dunkelberger, Bloomsbury University of Pennsylvania archivist, provided the information that teachers who had not attended a Pennsylvania normal school as students could obtain a diploma or state teaching certificate if they satisfied a number of conditions. These included passing an examination and presenting a thesis on an educational subject.

166. See for instance Elizabeth Binmore, "The financial outlook for the women teachers of Montreal," *Educational Record* (London: British and Foreign School Society) 13, no. 3 (1893): 69–74.

167. Gillett, *We Walked Very Warily*, especially 227, and "Carrie Derick (1862–1941) and the chair of botany at McGill," in *Despite the Odds*, 74–87; Anon., "Carrie Matilda Derick, 1862–," in *Canadian Who's Who 1938–1939*, vol. 3, ed. Roberts and Tunnell (Toronto: Trans-Canada Press, 1939), online at www.rootsweb.ancestry.com/~qcmntl-w/DerickCarrieMatilda.html (June 2008); Mrs. A. F. Byers, "The late Miss Carrie Derick," *McGill News* 23 (Summer 1942): 13–14; Anon., "Dr. Carrie M. Derick," obituary, *New York Times*, 11 November 1941, 23; Centre for Canadian Studies, Mount Allison University, "Carrie Derick 1862–1941," www.mta.ca/faculty/arts/canadian_studies/english/about/study_guide/famous_women/carrie_derrick.html (April 2009); National Library of Canada website, Canadian Women in Science, "Carrie Matilda Derick (1862–1941), botanist," www.ncl-bnc.ca/2/12/h12-403-e.html (July 2004); *American Men of Science*, 3rd ed., 1921, 176. I thank Andra Syvanen, McGill University Archives, for information about Carrie Derick.

168. These articles were reprinted in book form: Carrie M. Derick, *Flowers of the Field and Forest* (Montreal: *Family Herald and Weekly Star*, 1901).

169. McGill University Archives was unable to verify the year of the award of Derick's M.A. degree or provide the title for an M.A. thesis.

170. See for instance the sketch of plant geneticist Edith Saunders of Newnham College, Cambridge, in Creese, *Ladies in the Laboratory?* 43–44.

171. Carrie M. Derick, "Professions and careers open to women (c. 1898–1900)," in *Women of Canada: Their Life and Work* (Montreal: National Council of Women of Canada, 1900), 57–62; Carrie M. Derick, "In the 80s," *Old McGill* 29 (1927): 200, 350, 356.

172. Carrie M. Derick, "Two plant associations from areas near Radville, Saskatchewan," in John Stansfield and Carrie M. Derick, "The problem of the 'Burn-out' district of southern Saskatchewan," *Transactions of the Royal Society of Canada*, sect. 4 (1919): 61–73 on 67–73. Carrie M. Derick, "The trees of McGill University," *McGill News* (Winter 1929), reprinted as 5 p. booklet, Montreal, 1929. A search of the standard scientific indexes for the period did not uncover any technical publications by Carrie Derick, other than those listed in the notes and the bibliography given here. Another general paper by her, entitled "On the border," which described the landscape and the beliefs of earliest settlers along the border areas between New England and Canada, appeared in the *McGill University Magazine* 5, no. 1 (1905): 125–29.

173. Ralph Estey, “Margaret Newton: Distinguished Canadian scientist,” in *Despite the Odds*, 236–47, 427–28, and “Margaret Newton: Distinguished Canadian scientist and first woman member of the Québec Society for the Protection of Plants,” *Phytoprotection* 68 (1987):79–85; Thorvaldur Johnson, “Margaret Newton, 1887–1971,” *Proceedings of the Royal Society of Canada* 4th ser., 11 (1971): 83–86; Anon., “Flavelle Medal. Margaret Newton,” *Proceedings of the Royal Society of Canada* 3rd ser., 42 (1948): 47–48; Marie A. C. Langham, “Women in plant pathology—three women who led the way,” APSnet Education Center, http://199.86.26.56/education/K-12PlantPathways/NewsViews/Archive/2005_08.html (Feb. 2008); James A. Kolmer, “Margaret Newton: Pioneering rust researcher,” American Phytopathological Society, APSnet Feature Story, March 2005, www.apsnet.org/online/feature/newton (May 2009); Margaret W. Rossiter, *Women Scientists in America: Struggles and Strategies to 1948* (Baltimore: Johns Hopkins University Press, 1982), 380 note 32.

174. From 1907 Macdonald College was the home of the School of Household Science and also that of the School for Teachers, the successor to McGill Normal School. Thus women outnumbered men on the campus.

175. The development of the Marquis cultivar, for a time considered the “king” of wheats, was one of the great practical achievements of Canadian agriculture. Produced by crossing a variety of Indian Hard Red Calcutta with Red Fife at the Central Experimental Farm, Ottawa, during the first decade of the twentieth century, it was the premier wheat grown in North America from the 1920s until the 1940s and also the parent of many subsequent cultivars.

176. See Margaret Newton, “Studies in the rusts of Ste. Anne de Bellevue.” Macdonald College, undergraduate project, biology, 1918 (Sainte-Anne-de-Bellevue: Macdonald College, 1918), 84 pp.; E. C. Stakman and F. J. Piemeisel, “A new strain of *Puccinia graminis*” (abstract), *Phytopathology* 7 (1917): 73.

177. Pearl Clayton Stanford, from the Nova Scotia Agricultural College, a student of horticulture, joined Margaret Newton’s class at Macdonald College when Margaret was in her third year. Shortly after graduating, Pearl Stanford married writer Napoleon Paul St. Pierre. Her son, Paul St. Pierre, born 1923, became well known as a journalist and author. See Elizabeth Lumley, “St. Pierre, Paul,” in *Canadian Who’s Who* (2003), 1191.

178. Margaret Newton, “Studies in wheat stem rust (*Puccinia graminis tritici*) . . .,” *Proceedings and Transactions of the Royal Society of Canada* 3rd ser., 16, sect. 5 (1922): 153–210 (Ph.D. dissertation, University of Minnesota, 1922).

179. Margaret Newton, Thorvaldur Johnson, and Archibald Brown, “A study of the inheritance of spore colour and pathogenicity in crosses between physiologic forms of *Puccinia graminis tritici*,” *Scientific Agriculture* [Ottawa] 10, no. 12 (1930): 775–98; Thorvaldur Johnson, Margaret Newton, and Archibald Brown, “Hybridization of *Puccinia graminis secalis* and *Puccinia graminis agrostidis*,” *Scientific Agriculture* [Ottawa] 13, no. 3 (1932): 141–53; Thorvaldur Johnson and Margaret Newton, “Mendelian inheritance of certain pathogenic characters of *Puccinia graminis tritici*,” *Canadian Journal of Research., Sect. C. Botanical Sciences* 18, no. 10 (1940): 489–506.

180. Nikolai Ivanovich Vavilov (1887–1943), who traveled extensively and built up the world’s largest collection of plant seeds, was a steady critic of the non-Mendelian concepts of Lysenko. Arrested in 1943, he died in prison shortly after. Today the Vavilov Institute of Plant Industry in St. Petersburg still maintains one of the world’s largest collections of plant genetic material.

181. Anon., “Flavelle Medal.”

182. The following list, along with the five papers already referred to in notes 176, 178, and 179, provides a fairly complete bibliography of Margaret Newton’s publications, collected in large part from *Biological Abstracts*:

Newton, M., “Biologic forms of wheat stem rust in Western Canada,” *Proceedings of the Western Canadian Society of Agronomy* 1 (1920): 34–35.

———, “A preliminary note on the occurrence of biologic forms of wheat stem rust in Western Canada,” *Phytopathology* (hereafter *Phytopath.*) 11 (1921): 202.

Newton, M., and T. Johnson, “Physiologic forms of wheat stem rust in Western Canada,” *Scientific Agriculture* (hereafter *Sci. Agric.*) 7 (1927): 158–61.

———, “Greenhouse experiments on the relative susceptibility of spring wheat varieties to seven physiologic forms of wheat stem rust,” *Sci. Agric.* 7 (1927): 161–65.

———, “Colour mutations in *Puccinia graminis tritici* (Pers.) Erikss and Henn,” *Phytopath.* 17 (1927): 711–25.

Newton, M., T. Johnson, and A[rchibald] M. Brown, “New physiologic forms of *Puccinia graminis tritici*,” *Sci. Agric.* 9, no. 4 (1928): 209–15.

———, “Physiologic forms of wheat stem rust in Canada,” *Phytopath.* 18, no. 5 (1928): 478–79 (abstract).

Newton, M., and A. M. Brown, “The dwarf leaf rust of barley in Western Canada (*Puccinia anomala* Rostr.),” *Phytopath.* 18, no. 5 (1928): 481 (abstract).

Newton, M., and T. Johnson, “The occurrence of yellow stripe rust (*Puccinia glumarum*) in Western Canada,” *Phytopath.* 18, no. 5 (1928): 481 (abstract).

Newton, M., T. Johnson, and A. M. Brown, “Reactions of wheat varieties in the seedling stage to physiologic forms of *Puccinia graminis tritici*,” *Sci. Agric.* 9 (1929): 656–61.

- , “Hybridization of physiologic forms of *Puccinia graminis tritici*,” *Phytopath.* 20 (1930): 112–13 (abstract).
- , “A preliminary study on the hybridization of physiologic forms of *Puccinia graminis tritici*,” *Sci. Agric.* 10, no. 11 (1930): 721–31.
- Goulden, C[yril] H., M. Newton, and A. M. Brown, “The reaction of wheat varieties in two stages of maturity to sixteen physiologic forms of *Puccinia graminis* Pers. var. *tritici* Erikss. and Henn.,” *Canadian Phytopath. Soc.* 1 (1930): 13 (abstract).
- , “The reaction of wheat varieties at two stages of maturity to sixteen forms of *Puccinia graminis tritici*,” *Sci. Agric.* 11, no. 1 (1930): 9–25.
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183. Marlene F. Rayner-Canham and Geoffrey W. Rayner-Canham, *Harriet Brooks: Pioneer Nuclear Scientist* (Montreal: McGill–Queen's University Press, 1992, 1994), "Harriet Brooks—pioneer nuclear scientist," *American Journal of Physics* 57, no. 10 (1989): 899–902, and "Canada's first woman nuclear physicist, Harriet Brooks, 1876–1933," in *Despite the Odds*, 195–203, 421–22; Ernest Rutherford, "Obituary. Harriet Brooks (Mrs. Frank Pitcher)," *Nature* 131 (1933): 865; Marjory Malley, "Brooks, Harriet T. (1876–1933)," in *Biographical Dictionary of Women in Science. Pioneering Lives from Ancient Times to the Mid-20th Century*, 2 vols., ed. Marilyn Ogilvie and Joy Harvey (New York: Routledge, 2000), vol.1, 184–85; Gillett, *We Walked Very Warily*; Ani Aprahamian, "Harriet Brooks: Pioneer nuclear scientist," *Physics Today* (March 1993): 85–86, a review of the 1992 book by Rayner-Canham and Rayner-Canham; Mary Elvira Weeks, *Discovery of the Elements* (Easton, Pa.: *Journal of Chemical Education*, 1933–1968), 7th ed., revised and new material added by Henry M. Leicester; Anon., "Harriet Brooks 1876–1933," http://cwp.library.ucla.edu/Phase2/Brooks_Harriet@842580299.html (May 2009); Anon., "Harriet Brooks, Canada: 1876–1933," www.mphpa.org/classic/HF/Biographies%20-%20Women/brooks.htm (Aug. 2008).
184. Anne Molson, wife of J. H. R. Molson, one of the early governors of McGill University, was a leading figure in the effort to establish opportunities for women in higher education in Montreal in the 1870s and 1880s (Gillett, *We Walked Very Warily*, 54, 56, 61).
185. See Weeks, *Discovery of the Elements*, 787; M. F. Rayner-Canham and G. W. Rayner-Canham, "Pioneer women in nuclear science," *American Journal of Physics* 58, no. 11 (1990): 1036–43, particularly 1041–42; Gino Segré, "The family business. Modern physics through the generations," *Technology Review* 112, no. 2 (2009): 70–79, especially 73.
186. Harriet Brooks, "Damping of the oscillations in the discharge of a Leyden Jar," M.A. thesis, McGill University, 1901.
187. See A. S. Eve, "The Macdonald physics building, McGill University, Montreal," *Nature* 74 (19 July 1906): 272–75.
188. Ernest Rutherford and Harriet T. Brooks, "The new gas from radium," *Transactions of the Royal Society of Canada* 2nd ser., 7, sect. 3 (1901): 21–25 and *Chemical News* (25 April 1902): 196; Ernest Rutherford and Harriet T. Brooks, "Comparison of the radiations from radioactive substances," *Philosophical Magazine* Ser. 6, (1902): 1–23.
189. Harriet Brooks, "A volatile product from radium," *Nature* 70 (1904): 270. See also E. Rutherford, "The successive changes in radioactive bodies," *Philosophical Magazine* 8 (1904): 636; *Philosophical Transactions* 204a (1904): 169–219; "Slow transformation products of uranium," *Nature* 71 (1905): 341–43. Soddy's description of the process of the building up of the "active deposit" as a thin layer on the surfaces exposed to the emanation is striking; he imagined it as "a continuous snowstorm silently going on covering every available surface with this invisible, unweighable but intensely radio active deposit" (Frederick Soddy, *The Interpretation of Radium* [New York: G. P. Putnam's Sons, 1922], 4th ed., 138).
190. The section of the emanation decay series involved here is the following:
Radium $\xrightarrow{-\alpha}$ Radon (the emanation) $\xrightarrow{-\alpha}$ Radium A (an isotope of polonium) $\xrightarrow{-\alpha}$ Radium B (an isotope of lead) $\xrightarrow{-\beta}$ Radium C (an isotope of bismuth), etc., where α is an alpha particle of mass 4 and β an electron. The principle of conservation of momentum requires that expulsion of an α -particle of mass 4 (as from Radium A going to Radium B) will cause B to recoil with a velocity that depends on its mass—the phenomenon Harriet Brooks observed. See also Rutherford, "Obituary."
191. Harriet Brooks, "The decay of the excited radioactivity from thorium, radium and actinium," *Philosophical Magazine* 8 (1904): 373–84.

192. For Maltby see Creese, *Ladies in the Laboratory?* 214–15.
193. André Debierne, “Sur le coefficient de diffusion dans l’air de l’émanation de l’actinium,” *Le Radium* 4 (1907): 213–18; André Debierne, “Sur le depot de la radioactivité induite du radium,” *Le Radium* 6 (1909): 97–106; Lucie Blanquies, “Comparison entre les rayons α produits par différentes substances radioactive,” *Le Radium* 6 (1909): 230–32.
194. Aprahamian, “Harriet Brooks,” 86.
195. See also Rayner-Canham and Rayner-Canham, “Pioneer women in nuclear science,” especially 1041.
196. The once widely used but now largely outdated *Discovery of the Elements* (see note 183) is probably the one notably earlier account available of Harriet Brooks’s research with Rutherford at McGill. In this work, which went through seven editions, with revisions, between 1933 and 1968, Harriet Brooks’s research contributions are discussed, and, in at least the 1945 edition, her portrait is included.
197. Friedland, *University of Toronto*.
198. In the introductory paragraph to her paper on early women students at three major Canadian universities, Jo LaPierre quoted a noteworthy passage from the diary of early University College, Toronto, student Bessie Scott. Only two weeks after her registration in October 1889, Scott wrote, “Decided to give up Math and take Moderns.” She greatly enjoyed mathematics, which had been her best subject in her junior matriculation examinations the previous spring, whereas she was awarded only third-class standing in French, German, and English. Nevertheless she held to her decision, at the end of her first year writing, “Our last exam in Mathematics. How strange it seems never to write on my beloved Math again.” This and similar decisions made by so many early women students was no doubt influenced by lingering prejudices, pressures, and expectations in contemporary society that made such areas as language studies more acceptable fields for women. (Jo LaPierre, “The academic life of Canadian co-eds, 1880–1900,” *Historical Studies in Education* 2 (1990): 225–45, on 225). Only after the start of the twentieth century were Canadian women finding a foothold in the male-dominated world of scientific research; Elizabeth Laird and Cynthia Benson at University College, Toronto, and Maude Abbott and Harriet Brooks at McGill in Montreal were some of the earliest to lead the way.
199. Friedland, *University of Toronto*, especially chapter 9, “1880. The admission of women,” 85–95; Sara Z. Burke, “New women and old Romans: Co-education at the University of Toronto, 1884–95,” *Canadian Historical Review* 80, no. 2 (1999): 219–41.
200. M. E. (Nellie) Spence, “Once there were no women at varsity,” *University of Toronto Monthly* 33, no. 4 (January 1933): 121–23 and “Eliza May Balmer,” *University of Toronto Monthly* 33, no. 5 (February 1933): 146–49; Stacey Gibson, “Fairly determined,” *University of Toronto Magazine*, online ed., www.magazine.utoronto.ca/02spring/women.asp (Sept. 2008); Friedland, *University of Toronto*, 90, 91, 94.
201. Friedland, *University of Toronto*, 90, 94; Dagg, *Feminine Gaze*, 286–87.
202. Nellie Spence, *Topical Studies in Canadian History, Covering the Work Prescribed for Primary, Leaving, and Matriculation Examinations in Ontario* (Toronto: C. J. Musson, 1897, 1981).
203. Nellie Spence, *The Schoolboy in the War* (Toronto, C. J. Musson, 1919; CIHM-ICMH Microfiche series, no. 97667); *Some Young Immortals* (Canada?: n.p., 1920; CIHM-ICMH Microfiche series, no. 88321, reprinted from the *Canadian Magazine*, 1920). See also entry for Alan Barrie Duncan in Veterans Affairs Canada, <http://vac-acc.gc.ca/print.cfm?lang=english&layout=remembers&source=collections/virtualmem/Detail&casualty=522544> (April 2009), and Canadian Libraries, Internet Archive, www.archive.org/details/schoolboyinwar00spenuoft (June 2009).
204. Harris, *Higher Education in Canada*, 7, 127–28; Jean O’Grady, *Margaret Addison: A Biography* (Montreal: McGill–Queen’s University Press, 2001), 34–35.
205. There is also a brief mention of Adeline Shenick in Johanna M[aria] Selles, *Methodists and Women’s Education in Canada, 1836–1925* (Montreal, Buffalo: McGill–Queen’s University Press, 1996), 163. Shenick entered the science department at Victoria College in 1879 and was given permission to read for a science degree without residence. She graduated in 1887, having studied while also holding a teaching position at Ottawa Normal School.
206. Elizabeth Kalmakoff, “Greenwood Andrews, Nellie (1864–1958),” University of Regina and Canadian Plains Research Center website, http://esask.uregina.ca/entry/greenwood_andrews_nellie_1864_1958.html (April 2009); Selles, *Methodists and Women’s Education*, 163; O’Grady, *Margaret Addison*, 34–35; “Passing through Port Hope . . . On the way into Canadian history, *It’s about time*.” Newsletter of the Port Hope Archives (Summer 2006): 6, <http://porthopearchives.com/Summer%202006.pdf> (Sept. 2008); information from Rhianna Edwards, University Archives, Mount Allison University Libraries and Archives.
207. First opened in 1826 as Peterborough Collegiate and Vocational Institute and renamed Peterborough Collegiate Institute in 1871, the school’s grammar school division accepted girls from 1869. See Trent University Archives. Fonds Level Description. Peterborough Collegiate and Vocational Institute, 94–015, Biography/History, www.trentu.ca/admin/library/archives/94-015.htm (Sept. 2008).

208. James M. Pitsula, *An Act of Faith: The Early Years of Regina College* (Regina, Sask.: Canadian Plains Research Center, University of Regina, 1988).

209. See John G. Reid, *Mount Allison University: A History, to 1963, Vol. 1: 1843–1914* (Toronto, Buffalo: University of Toronto Press, 1984), 255.

210. Ralph A. Bradshaw, “Clara Cynthia Benson,” *ASBMB Today* (March 2006): 14–17, available at the American Society for Biochemistry and Molecular Biology website, <https://www.asbmb.org/uploadedFiles/Publications/ASBMBToday/ASBMBToday-2006-3.pdf> (June 2009); Nicolle Wahl, “A voice from the past. U. of T. re-enacts 100-year-old thesis defense,” *University of Toronto Magazine* (June 2003), www.news.utoronto.ca/bin5/030609i.asp (Dec. 2007); Susan Bustos, “The joy of cooking: With gunpowder,” *Inkling Magazine* (21 February 2007), www.inklingmagazine.com/articles/dead-bakers-society/ (May 2009); Stephen L. Gray, “The descendents and ancestors of John Green and Alicia née Benson, Peterborough, Ontario, 1841 to present,” privately published, 1st ed. 1998, on file with the Ottawa Branch, Ontario Genealogical Society, Ottawa; November 2001 extract online (substantially updated) available at www.nhb.com/hunter/Families/BensonsP.pdf (Sept. 2008); Marianne Gosztonyi Ainley, “‘Women’s Work’ in Canadian Chemistry,” *Canadian Women’s Studies* 13, no. 2 (1993): 43–46; “Canadian women’s contributions to chemistry, 1900–1970,” *Canadian Chemical News* (April 1994), based on a presentation by Marianne Ainley and Tina Crossfield at a Chemical Education Division session at the CSC conference in Sherbrooke, QC, June 1993, www.entrepreneur.com/tradejournals/article/print/15417817.html (May 2009); Anon., obituary, *Chemistry in Canada* (June 1964): 48; *American Men of Science*, 4th ed. (1927), 76.

211. Clara C. Benson, “The rates of the reactions in solutions containing ferrous sulphate, potassium iodide and chromic acid,” Ph.D. thesis, University of Toronto, 1903; published in the *Journal of Physical Chemistry* 7 (1903): 356–88.

212. Clara C. Benson, “The rate of oxidation of ferrous salts by chromic acid,” *Journal of Physical Chemistry* 7 (1903): 1–14; “The composition of surface layers of aqueous amyl alcohol,” *Journal of Physical Chemistry* 7 (1903): 532–36; “A reaction whose rate is diminished by raising the temperature,” *Journal of Physical Chemistry* 8 (1904): 116–21.

213. Lillian Frances Massey, later Treble (1854–1915), was the only daughter of Hart Amerrin Massey, director of the Toronto-based implement manufacturing business. After the death of her father in 1896, she and her two surviving brothers were named trustees of his estate and thus became responsible for the philanthropic use of more than a million dollars. Very interested in work on social reform, especially helping women to improve household living conditions, she made substantial contributions to the development of the new field of domestic science in Canada. See David Roberts, “Massey, Lillian Frances (Treble),” in *Dictionary of Canadian Biography*, online ed., www.biographi.ca/009004-119.01-e.php?BioId=41694 (April 2009).

214. A. B. Macallum and Clara C. Benson, “The composition of dilute renal secretion,” *Journal of Biological Chemistry* 6 (1909): 87–104; O. G. Patterson and Clara C. Benson, “Note on the setting of gelatine,” *Journal of Home Economics* 2 (1911): 656–57; Clara C. Benson et al., “A day’s metabolism,” *Journal of Home Economics* 2 (1911): 658; Clara C. Benson, “Urea in dogfish and skate,” *Proceedings of American Society for Biological Chemistry, Journal of Biological Chemistry* 41, no. 3 (1920): lx; Clara C. Benson, “Chemical change in fish muscle during *rigor mortis*,” *Proceedings of American Society for Biological Chemistry, Journal of Biological Chemistry* 63 (1925): lxxii–lxxiii; Clara C. Benson, “Hydrogen ion concentration of fish muscle,” *Journal of Biological Chemistry* 78 (1928): 583–90.

215. Annie Lewisa Laird (1871–1939), sister of physicist Elizabeth Laird (see above), was principal of the Lillian Massey School of Household Science and Art (renamed the Lillian Massey Normal Training School of Household Science in 1902) before becoming director of the faculty of household science in 1906. Along with Lillian Massey she planned much of the interior of a new building for household science, opened in 1913, which was widely regarded as the finest facility in North America for instruction in that field. In 1918 Annie Laird received an honorary M.S. degree from Drexel Institute of Technology, Philadelphia, later well known for its household science teaching. See Roberts, “Massey, Lillian Frances (Treble).”

216. Information from Newnham College, Cambridge, Archives, for which I thank archivist Anne Thomson; John G. Slater, *Minerva’s Aviary: Philosophy at Toronto, 1843–2003* (Toronto: University of Toronto Press, 2005), 290–91; Reid, *Mount Allison University*, 239; information from Rhianna Edwards, University Archives, Mount Allison University.

217. Newmarket High School, founded as a grammar school in 1843, has the distinction of being the second-oldest high school in Ontario.

218. Belleville Seminary, Belleville, 105 miles northeast of Toronto, was founded as a secondary school by the Methodist Episcopal Church in 1857 and chartered as Albert College in 1866. During the sixteen-year period of its existence as a college (1867–1883) it granted degrees in a number of areas, including arts, theology, and law.

Following the union of the Methodist churches of Canada in 1884, it reverted to its status of secondary school, its students transferring to Victoria College, Cobourg. See Harris, *Higher Education in Canada*, 10, 113.

219. August Kirschman, a student of Wilhelm Wundt at Leipzig, led work in experimental psychology at the University of Toronto from 1893 until 1908, when he returned to Germany. Under his direction the Toronto psychology laboratory became widely recognized. See “Department of Philosophy—University of Toronto,” <http://philosophy.utoronto.ca/graduate/ld.html?name=History%20of%20the%20department> (April 2009).

220. Emma S. Baker, “Experiments on the aesthetic of light and colour,” *University of Toronto Studies, Psychological Series* vol. I, no. 4, and vol. II, no. 1, 1900, 1902, reprinted 1903.

221. Emma Sophia Baker and Susie A. Chown, “Experiments on the aesthetic of light and colour,” *University of Toronto Studies, Psychological Series* vol. I, no. 4, 1900; August Kirschman, Emma Sophia Baker, and William James Dobbie, “Conceptions and laws in aesthetic: Experiments on the aesthetic of light and colour (by Emma Baker); experiments with school children on colour combinations (by W. J. Dobbie),” *University of Toronto Studies, Psychological Series* vol. I, no. 4, 1900. Susannah Amelia Chown (1875–1913) was the eldest daughter of Rev. Edwin A. Chown and his wife, Mary, née Richardson. After completing three years of study at Victoria University (second year to fourth year of the liberal arts course, 1896–1899) she was awarded a University of Toronto B.A. degree. Her joint paper with Emma Baker appears to have been her only publication. (Information from Lagrimas Ulanda, records archivist, University of Toronto.)

222. “Laird Oral History,” in American Institute of Physics Niels Bohr Library, UCLA, extracts available at “Contributions of women in physics” at UCLA website http://cwp.library.ucla.edu/Phase2/Laird_Elizabeth_Rebecca@944123456.html (April 2009); D. R. Moorcroft, “A history of the department of physics and astronomy at the University of Western Ontario,” *Physics in Canada* 55, no. 4 (1999): 159–76, especially the section “Physics during and after the Second World War,” www.physics.uwo.ca/~drm/history/dept_history/history_pic.htm (Oct. 2008); Mitchell Zimmer, “A part of our history: Dr Elizabeth Rebecca Laird,” University of Western Ontario, Science Flashpoint Archives, www.uwo.ca/sci/publications/flashpoint/archives/Laird.html (June 2008); Rayner-Canham and Rayner-Canham, “Pioneer women in nuclear science,” 1038–39; Anon., “Elizabeth Rebecca Laird,” obituary, *Journal of the Optical Society of America* 59 (1969): 1687; “Mercy Maus descendents,” <http://mausfamily.com/Mercy.html> (Sept. 2008); Marjorie Malley, “Laird, Elizabeth Rebecca (1874–1969),” in *Biographical Dictionary of Women in Science*, ed. Ogilvie and Harvey, vol. 2, 734–35; information from Lagrimas Ulanday, records archivist, University of Toronto.

223. G. Stokes, *Transactions of the Cambridge Philosophical Society* 9, part. 2 (1848): 35.

224. “Laird Oral History,” “Contributions of women in physics,” UCLA website.

225. See section on Margaret Maltby in Creese, *Ladies in the Laboratory?* 214–15.

226. The Sarah Berliner Fellowship was funded by a bequest of \$25,000 from Emile Berliner, inventor of the phonograph record and a strong believer in education for women in scientific fields. Established in 1908, it provided \$1,200 for research by women in physics, chemistry, or biology.

227. Elizabeth Laird’s publications from 1901 until her retirement from Mount Holyoke College include the following: “The absorption spectrum of chlorine,” *Astrophysical Journal* 14 (1901): 85–115 (Ph.D. dissertation, Bryn Mawr College); “Note on thermoluminescence,” *Physical Review* 28 (1909): 151–52 (abstract of a paper given at the Baltimore meeting of the American Physical Society, 28–31 December 1908); “Ionization produced by Entladungsstrahlen and experiments bearing on the nature of the radiation,” *Physical Review* 30 (1910): 293–310 (paper presented at the Princeton meeting of the American Physical Society, October 1909, and abstract, *Physical Review* 29 (1909): 559); “Entladungsstrahlen at atmospheric pressure and at diminished pressures,” *Physical Review* 33 (1911): 512–27; “Über die Erzeugung von Röntgenstrahlen durch langsame Kathodenstrahlen,” *Annalen der Physik* 46 (1915): 605–22; “X-rays produced by slow-moving cathode rays,” *Physical Review* 5, 2nd ser. (1915): 337–38 (abstract of a paper given at the Philadelphia meeting of the American Physical Society, 28–31 December 1914); “X-rays from the electrical discharge,” *Physical Review* 5, 2nd ser. (1915): 338 (abstract of a paper given at the New York meeting of the American Physical Society, 27 February 1915); “Note on an article by H. M. Dadourian on soft X-rays,” *Physical Review* 15 (1920): 293–96; Elizabeth R. Laird and Vola P. Barton, “Soft X-rays produced by cathode rays from 200 to 600 volts velocities,” *Physical Review* 15 (1920): 297–308; “Transmission by thin films in the extreme ultraviolet,” *Physical Review* 15 (1920): 543–49; “An increase in density in thin films,” *Physical Review* 19 (1922): 384–85; “Reflection of soft X-rays,” *Physical Review* 27 (1926): 510 (abstract); “Absorption in the region of soft X-rays,” *Physical Review* 29 (1927): 41–49; “Reflection of soft X-rays,” *Physical Review* 29 (1927): 605–6 (abstract); Elizabeth R. Laird and Jos. E. Henderson, “Reflection of soft X-rays,” *Physical Review* 33 (1929): 291 (abstract); Elizabeth R. Laird and Jos. E. Henderson, “Reflection of soft X-rays,” *Proceedings of the National Academy of Science* 14 (1928): 773–77; Elizabeth R. Laird and Dorothy A. Franklin, “The Raman effect in trimethylethylene,” *Physical Review* 36 (1930): 147; Elizabeth R. Laird and Vera Starling, “The Raman effect in solutions of sodium nitrate of varying concentrations,” *Physical Review* 36

(1930): 148–49; Elizabeth R. Laird and Dorothy A. Franklin, “The Raman spectrum of sodium nitrate, sodium acetate and acetic acid,” *Physical Review* 45 (1934): 738.

228. Moorcroft, “History of the department of physics.”

229. Elizabeth R. Laird and K. Ferguson, “Dielectric properties of some animal tissues at metre and centimetre wave-lengths,” *Canadian Journal of Research. Section A. Physical Sciences* 27 (1949): 218–30; Elizabeth R. Laird, “Dielectric properties of some solid proteins at wave-lengths 1.7 metres and 3.2 centimetres,” *Canadian Journal of Research. Section A. Physical Sciences* 30 (1952): 663–69.

230. Quoted by Zimmer, “Part of our history.”

231. G. Winston Sinclair, “Memorial to Alice Evelyn Wilson 1881–1964,” *Proceedings of the Geological Association* 16 (1965): 127–28, and “Alice Evelyn Wilson 1881–1964,” *Proceedings and Transactions of the Royal Society of Canada* 4th ser., vol. 4 (June 1966): 117–21; Loris S. Russell, “Alice Evelyn Wilson 1881–1964,” *Canadian Field-Naturalist* 79 (July–September 1965): 159–61; Debbie Jones, “Canada’s first woman geologist,” *Earth Science* 28 (1975): 292; Barbara Meadowcroft, “Alice Wilson, 1881–1964: explorer of the earth beneath her feet,” in *Despite the Odds*, ed. Ainley, 204–19; Joy Harvey and Marilyn Ogilvie, “Wilson, Alice Evelyn (1881–1964),” in *Biographical Dictionary of Women in Science*, ed. Ogilvie and Harvey, vol. 2, 1383–84.

232. Alice E. Wilson, “A new Ordovician pelecypod from the Ottawa district,” *Ottawa Naturalist* 29 (1915): 85–86.

233. Alice E. Wilson, “The range of certain Lower Ordovician faunas of the Ottawa Valley with descriptions of some new species,” Geological Survey of Canada Bulletin 33 (National Museum of Canada, Bulletin, Geological Series 40) 1921.

234. Joan Burke, “Fritz, Madeleine Alberta,” in *Canadian Encyclopedia*, online ed., www.thecanadianencyclopedia.com/index.cfm?PgNm=TCE&Params=A1ARTA0003074 (Nov. 2008); Marianne G. Ainley, “Last in the field? Canadian women natural scientists, 1815–1965,” in *Despite the Odds*, 25–62, on 32–33; Joy Harvey and Marilyn Ogilvie, “Fritz, Madeleine Alberta (1896–1990),” in *Biographical Dictionary of Women in Science*, ed. Ogilvie and Harvey, vol. I, 475.

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236. See Barnett Richling, “Politics, bureaucracy, and Arctic archaeology in Canada, 1910–39,” *Arctic* 48 (June 1995): 109–117, especially 110–11.

237. Alice Evelyn Wilson, “The geology of the Cornwall district, Ontario, Canada,” Ph.D. thesis, University of Chicago (Chicago: University of Chicago, 1929).

238. Alice Evelyn Wilson, *Geology of the Ottawa–St. Lawrence Lowland, Ontario and Quebec* (Ottawa: Department of Mines and Technical Surveys, Canada, 1946, reissued 1964 and 1976), Geological Survey of Canada. Memoir 241.

239. Alice Wilson’s later paleontological bulletins include the following: “Echinodermata of the Ottawa Formation and the Ottawa–St. Lawrence Lowland,” Geological Survey of Canada Bulletin 4, 1946; “Brachiopoda of the Ottawa Formation of the Ottawa–St. Lawrence Lowland,” Geological Survey of Canada Bulletin 8, 1946; “Trilobita of the Ottawa Formation of the Ottawa–St. Lawrence Lowland,” Geological Survey of Canada Bulletin 9, 1947; “Miscellaneous classes of fossils, Ottawa Formation, Ottawa–St. Lawrence Valley,” Geological Survey of Canada Bulletin 11, 1948; “Gastropoda and Conularida of the Ottawa formation of the Ottawa–St. Lawrence lowland,” Geological Survey of Canada Bulletin 17, 1951; “Pelecypoda of the Ottawa Formation of the Ottawa–St. Lawrence Lowland,” Geological Survey of Canada Bulletin 28, 1956; “Cephalopoda of the Ottawa formation of the Ottawa–St. Lawrence Lowland,” Geological Survey of Canada Bulletin 67, 1961.

240. Alice Evelyn Wilson, *The Earth beneath Our Feet* (Toronto: Macmillan Co. of Canada, 1947), 249 pp.; *A Guide to the Geology of the Ottawa District* (Ottawa: Ottawa Field-Naturalists’ Club, 1956, constituting *Canadian Field-Naturalist* vol. 70, no. 1, monograph, 68 pp., maps and illustrations).

241. Waite, *Lives of Dalhousie*, especially pp. 130–36; Harris, *Higher Education in Canada*, especially 104–5; Lois Kernaghan, revised Peter Murchland, “Dalhousie University,” in *The Canadian Encyclopedia*, online ed., www.thecanadianencyclopedia.com/index.cfm?PgNm=TCE&Params=A1ARTA0002112 (April 2009); Dalhousie archives digital collections, “The buildings of Dalhousie University. Shirreff Hall,” www.library.dal.ca/duasc/buildings/ShirreffHall.htm (June 2008).

242. Lucy Maud Montgomery, “The thirty sweet girl graduates of Dalhousie University,” *Halifax Herald*, 29 April 1896, 12; information from Sandra Bartlett, librarian, Armbrae Academy, Halifax, extracted from Sandra Macleod, *A History of Halifax Ladies’ College* (Halifax: n.p., 1973); “Descendents of John Thompson and Mary Sunley of Yorkshire, whose descendents migrated to Nova Scotia / New Brunswick. Fifth generation,” www3.telus.net/chignecto/thompson/agag13.htm#30724 (Nov. 2009).

243. Established in 1887 by the Rev. Robert Laing, minister of St. Matthew's Church, Halifax, Halifax Ladies' College and Conservatory of Music was a well-managed school with a sound academic curriculum. For a time it also provided a certain amount of boarding accommodation for Dalhousie University women students.

244. Waite, *Lives of Dalhousie*, 134, 213; Ernest R. Forbes, "Ritchie, Eliza," *The Canadian Encyclopedia*, online ed., <http://thecanadianencyclopedia.com/index.cfm?PgNm=TCE&Params=A1ARTA0006849> (April 2009); Anon., "In memoriam," *The Alumnae News* 11, no. 16 (1934), online at Dalhousie University Libraries, www.library.dal.ca/index.php?option=com_content&Itemid=181&id=954&task=view (April 2009); Nova Scotia Advisory Council on the Status of Women, with revisions, Feb. 2003, "Foremothers on equality: Some early Nova Scotian suffragists," <http://women.gov.ns.ca/publications/NSFOREMOTHERS.pdf> (Oct. 2008); Judith Fingard, "Gender and inequality at Dalhousie: Women faculty before 1950," *Dalhousie Review* 64 (Winter 1984/85): 687–703, on 690. Sources differ on Eliza Ritchie's date of birth; 1856 is that given by the *Canadian Encyclopedia*.

245. Quoted in Waite, *Lives of Dalhousie*, 134.

246. Eliza Ritchie, "The problem of personality," Ph.D. thesis, Cornell University, June 1889.

247. See Creese, *Ladies in the Laboratory?* 347–49.

248. Eliza Ritchie, *Songs of the Maritimes: An Anthology of the Poetry of the Maritime Provinces of Canada* (Toronto: McClelland and Stewart, 1931), 213 pp.

249. See Montgomery, "Thirty sweet girl graduates." This article has been reproduced in "Appendix C: Montgomery on Gender," in Lucy Maude Montgomery, *Anne of Green Gables*, ed. Cecily Margaret Devereux (Peterborough, Ont.: Broadview Press, 2004), 371–81.

250. Kailash K. Anand, "Baxter, Agnes Sime (Hill)," in *Dictionary of Canadian Biography*, online ed., www.biographi.ca/009004-119.01-e.php?BioId=41314 (April 2009); A. M. M., "Agnes Sime Baxter," obituary, *Dalhousie Gazette* 49, no. 8 (15 June 1917): 1, 3; information from Eileen Keating, university records manager and assistant university archivist, Cornell University; J. J. O'Connor and E. F. Robertson, "Agnes Sime Baxter," in MacTutor History of Mathematics Archive, St. Andrews University, UK, [www-history.mcs.st-andrews.ac.uk](http://www-history.mcs.st-andrews.ac.uk/Baxter_biography) (Baxter biography at www-groups.dcs.st-and.ac.uk/~history/Printonly/Baxter.html) (Dec. 2007); Gary G. Cochell, "The early history of Cornell Mathematics Department: A case study in the emergence of the American mathematical community," *Historia Mathematica* 25 (1998): 133–53, especially Section 7, "Conclusions"; Ludy T. Benjamin and Amy D. Bertelson, "The early Nebraska psychology department, 1889–1930: Nursery for presidents of the American Psychological Association," *Journal of the History of the Behavioral Sciences* 11 (April 1975): 142–48, on 145.

251. Quotation from A. M. M., obituary.

252. For Charles Macdonald and James Gordon MacGregor see the biographies of both by Peter B. Waite in *Dictionary of Canadian Biography*, online ed. at, respectively, www.biographi.ca/009004-119.01-e.php?&id=nbr=6867 and www.biographi.ca/009004-119.01-e.php?&id_nbr=7551 (both accessed April 2009).

253. See Creese, *Ladies in the Laboratory?* 185, 188, 204.

254. O'Connor and Robertson, "Agnes Sime Baxter"; Anand, "Baxter, Agnes Sime (Hill)."

255. No copies of Agnes Baxter's Ph.D. thesis are in the archives of either Cornell University or Dalhousie University. Her thesis title was, "On Abelian Integrals, a resume of Neumann's 'Abelsche Integrale' with comments and applications." No publication information about any of Oliver's mathematical notes edited by Agnes Baxter has yet been found in any of the usual listings or archival holdings.

256. Harris, *Higher Education in Canada*, 163.

257. Derick, "Professions and careers open to women (c. 1898–1900)."

258. Carlotta Hacker, *The Indomitable Lady Doctors* (Halifax: Formac, 2001), 95 (earlier editions 1974 and 1984); Dalhousie University Medical Alumni Association, DMAA Endowments, Annie Hamilton Scholarship, <http://alumni.dal.ca/endowments.html> (Oct. 2008).

259. Hacker, *Indomitable Lady Doctors*, 95.

260. One might wonder if the Japanese army's occupation of the foreign enclaves in Shanghai on 8 December 1941 was in any way related to the death of Annie Hamilton two weeks later.

261. Reid, *Mount Allison University*, 108, 120.

262. The early history of the B.Sc. degree awarded by Canadian universities is complex, since it could represent a standard that was higher, lower, or equivalent to that represented by the B.A. At Mount Allison, which awarded six B.Sc. degrees between 1864 and 1878, the B.Sc. was a three-year degree of somewhat lower standard than the four-year B.A. See Harris, *Higher Education in Canada*, 126–27.

263. Reid, *Mount Allison University*, 120–21, 169, and "The education of women at Mount Allison, 1854–1914," *Acadiensis* 12 (1983): 3–33, especially 18; [Raymond C. Archibald?], "Our graduates, 1854–1904, Mount Allison Female Academy," *Allisonia* 2 (1904–05): 139–54, on 147; information from Rhianna Edwards, university archivist, Mount Allison University; *Beaver* magazine staff, "Moment," *Beaver* 84, issue 2 (April/May

2004): 9; “Grace Annie Lockhart,” CA Features Section 15, http://section15.ca/features/people/2004/06/02/grace_lockhart/ (June 2008).

264. Reid, *Mount Allison University*, 168–69; Descendents of Thomas Starr, www.portschefamily.com/starr/d10.htm (Oct. 2008); information from Rhianna Edwards, Mount Allison University.

265. [Archibald?], “Our graduates, 1854–1904,” 141.

266. [Archibald?], “Our graduates, 1854–1904,” 148; Hacker, *Indomitable Lady Doctors*, 74; Margaret Vanderzweerde, “Will the bells ring again? Christians in Amkhut, India, hope to celebrate the 100th anniversary of Christian mission among them with a new bell,” *Presbyterian Record* (February 1997), 31; Rev. James P. MacPhie, *Pictonians at Home and Abroad* (Boston: Pinkham Press, 1914), Ch. 8, “Pictonians in Foreign Lands,” online at www.rootsweb.ancestry.com/~nspictou/elect_text/Pictonians_ch_8.htm (Oct. 2008).

267. Information from Bethany Jost, archives and special collections, Acadia University; “Acadia Ladies’ Seminary Collection—1867–1946,” comp. Rhianna H. Edwards, revised January 2002, online at http://library.acadiau.ca/archives/research/acadia_archives/Acadia_Ladies_Seminary.pdf (Oct.2008); Acadia University website.

268. *The Acadia Record 1838–1953*, extract supplied by Bethany Jost, Acadia University.

269. Anon., “Annie Marion MacLean,” obituary, *American Journal of Sociology* 40, no. 1 (July 1934): 104; Jenn Bumb, “Annie Marion MacLean,” in *Women’s Intellectual Contributions to the Study of Mind and Society*, student papers given as part of an advanced seminar in the Department of Behavioral and Social Sciences, Webster University, St. Louis, Missouri, online at www.webster.edu/~woolflm/anniemaclean.htm (Aug. 2009); information from Bethany Jost, Acadia University; Virginia Kemp Fish, “Annie Marion MacLean: A neglected part of the Chicago School,” *Journal of the History of Sociology* 33 (1981): 43–62; Thomas J. Riley, book review, “*Wage-earning Women*, by Annie Marion MacLean,” *American Journal of Sociology* 16 (1910–1911): 270–72; Frances Fenton Bernard, book review, “*Women Workers and Society* by Annie Marion MacLean,” *American Journal of Sociology* 22 (1916–1917): 850.

270. Annie Marion MacLean, “Albion Woodbury Small: An appreciation,” *American Journal of Sociology* 32 (1926): 45–48; “Biography: Albion Woodbury Small,” www.answers.com/topic/albion-woodbury-small (Nov. 2008); Harry Elmer Barnes, “Albion Woodbury Small: Promoter of American sociology and expositor of social interest,” in *An Introduction to the History of Sociology*, ed. Harry Elmer Barnes (Chicago: University of Chicago Press, 1948), Ch. XXXIX, 766–92.

271. Annie Marion MacLean, “Factory legislation for women in the United States,” *American Journal of Sociology* 3 (1897–1898): 183–205; “Two weeks in a department store,” *American Journal of Sociology* 4 (1898–1899): 721–41; “Factory legislation for women in Canada,” *American Journal of Sociology* 5, (1899–1900): 172–81.

272. Gillett, *We Walked Very Warily*, 167.

273. Annie Marion MacLean, “Twenty years of sociology by correspondence,” *American Journal of Sociology* 28 (1922–1923): 461–72.

274. Annie Marion MacLean, “Life in the Pennsylvania coal-fields,” *American Journal of Sociology* 14 (1908–1909): 329–51; “With the Oregon hop-pickers,” *American Journal of Sociology* 15 (1909–1910): 83–95.

275. Annie Marion MacLean, *Wage-earning Women* (New York: Macmillan, 1910), 202 pp.; *Women Workers and Society* (Chicago: A. C. McClurg, 1916), 135 pp.

276. Annie Marion MacLean, “The plight of a rich man in a democracy,” *American Journal of Sociology* 21 (1915–1916): 239–44.

277. For some of MacLean’s later publications see, for example, Annie Marion MacLean, *Some Problems of Reconstruction* (Chicago: A. C. McClurg, 1921), 150 pp., part of the National Social Science series; *Our Neighbors* (New York: Macmillan, 1922), 288 pp., fiction; *Modern Immigration, a View of the Situation in Immigrant Receiving Countries* (Philadelphia and London: J. B. Lippincott, 1925), 393 pp., Lippincott sociological series.

278. See Creese, *Ladies in the Laboratory?* 139–41.

279. Hilda Neatby, *Queen’s University: Vol. I 1847–1917* (Montreal: McGill–Queen’s University Press, 1978); Harris, *Higher Education in Canada*; *Queen’s Encyclopedia*, online, Section W, “Women at Queen’s, admission of,” <http://qnc.queensu.ca/Encyclopedia/w.html> (Nov. 2009).

280. Hughes, “Early history of astronomy at Queen’s University.”

281. Gail MacMillan, “The road not taken: The James Fowler story,” *Queen’s Alumnae Review*, <http://alumni.review.queensu.ca/q/spring2003/history.htm> (Nov. 2009); LaPierre, “Academic life of Canadian co-eds,” 228, 229.

282. James Fowler played an important role in the development of Queen’s Department of Botany. By the time he retired in 1908, the museum of which he was the curator, now the Fowler Herbarium, housed 48,000 mounted specimens; a very large proportion of them had been acquired by him, either by exchange or his own collecting.

283. LaPierre, “Academic life of Canadian co-eds,” 229.

284. Julia Cataudella, "When women came to Queen's," *Canadian Medical Association Journal* 161, no. 5 (1999): 575–78; *Queen's Encyclopedia*, "Women medical students, expulsion of," <http://qmc.queensu.ca/Encyclopedia/w.html> (Dec. 2007); C. M. Godfrey, "The origins of medical education of women in Ontario," *Medical History* 17, no. 1 (1973): 89–94; A. A. Travill, "Early medical co-education and Women's Medical College Kingston, Ontario, 1880–1894," *Historic Kingston* 30 (January 1982): 68–89.

285. One of the consequences of these developments in Kingston is said to have been the very rapid establishing of a Woman's Medical College in Toronto, which also opened in October 1883; see Travill, "Early medical co-education," 77.

286. Sheryl Ann Stotts McLaren, "Becoming indispensable: A biography of Elizabeth Smith Shortt (1859–1949)," Ph.D. thesis, York University, 2001 (see also http://proquest.umi.com/dissertations/preview_page/NQ72026/10 [Nov. 2008]); *Queen's Encyclopedia*, "Smith, Elizabeth (1859–1949)" and "Shortt, Adam (1859–1931)," <http://qmc.queensu.ca/Encyclopedia/s.html> (Nov. 2008); Godfrey, "Origins of medical education," 90, 92; *Toronto Globe and Mail*, 15 January 1950, obituary, "Elizabeth Smith Shortt"; E. D. Smith Cherry Farm, www.cn411.ca/views01.aspx?LinkID=9CD3107890 (Nov. 2008); A. A. Travill, "Smith-Shortt, Elizabeth," *The Canadian Encyclopedia*, online ed., www.thecanadianencyclopedia.com/index.cfm?PgNm=TCE&PARAMS=A1ARTA000749 (April 2009).

287. What was originally the family-owned E. D. Smith Company is now a much-expanded publicly traded corporation with interests in both the United States (as E. D. Smith USA Inc.) and Canada.

288. Jennie Kidd Trout (1841–1921), née Gowanlock, born in Kelso in the Scottish Borders, moved with her parents to Canada in 1847; the family settled near Stratford, Ontario. In 1865 Jennie married Toronto publisher Edward Trout. Six years later (1871), after a long period of poor health, she enrolled at the Toronto School of Medicine, but finding the harassment from male fellow-students and some professors too distressing, she transferred after one year to the Woman's Medical College of Pennsylvania in Philadelphia. She received her degree in 1875 and returned to Canada, where she passed the Ontario College of Physicians and Surgeons examination. For several years she ran a very popular and fairly successful "Therapeutic and Electrical Institute" in Toronto, which specialized in electrotherapy treatments for women; her free dispensary for the poor was conducted for a short time at the same Jarvis Street location, until costs became too great. Illness caused her to retire in 1882, and after that she spent much of her time in Florida. In 1908 she and her husband moved to Los Angeles, California, where she died on 10 November 1921 at the age of eighty. See Susanna McLeod, "Jennie Kidd Trout: Canada's first licensed female doctor," online publication suite101.com, Canadian History, http://canadianhistory.suite101.com/article.cfm/jennie_kidd_trout (Dec. 2007); Carlotta Hacker, "Trout, Jennie (Jenny) Kidd," *Canadian Encyclopedia*, online ed., www.thecanadianencyclopedia.com/index.cfm?PgNm=TCE&Params=A1ARTA0008138 (April 2009).

289. The University of Michigan Medical School in Ann Arbor opened to women in 1870. The first woman to graduate, Amanda Sanford (1838–1894), received her M.D. in 1871, having previously studied at the Woman's Medical College of Pennsylvania and the New England Hospital for Women and Children in Boston. She went on to a long and successful career in obstetrics, gynecology, and general medicine in Auburn, Cayuga County, New York. She married Patrick Hickey, a widower with children, in 1884 but managed their household without giving up her practice. See Janet Tarolli, "First ladies in medicine at Michigan," *Medicine at Michigan* 2, no. 3 (2000), online at www.medicineatmichigan.org/magazine/2000fall/women/default.asp (Dec. 2008).

290. One of Elizabeth Shortt's correspondents was the well-known Yukon politician and botanical artist Martha Louise Black (see the account of Martha Black, above).

291. Travill, "Early medical co-education," 82, 86.

292. Alice McGillivray, "A Woman's Address," as printed in the *Daily British Whig* (Kingston) vol. 43 (3 May 1884, evening ed.).

293. Jean Sinclair MacKay and Margaret MacKellar, "Elizabeth Beatty, M.D.," *The Missionary Monthly* (May 1940): 207–8.

294. See also the Mount Allison University section above for a note on the career of medical missionary Mary McKay in the Indore Presbytery.

295. "The Record News, Smith Falls—Newspaper Articles" for 14 February 1889, http://rootsweb.ancestry.com/~onlanark/NewspaperClippings/RecordNews/record_news_thirteen.htm (April 2009); "Queen's Biochemistry History," <http://meds.queensu.ca/biochem/history> (Nov. 2008); Neatby, *Queen's University*, 288.

296. Charlotte Elizabeth Whitton (1896–1975), a Canadian feminist well known in her time, was born in Renfrew, Ontario, on 8 March 1896. She entered Queen's University in 1914 and graduated with an M.A. in 1917. Then followed a long career in social work and politics. Coeditor of the publication *Social Welfare*, she became the first full-time director of the Canadian Council on Child Welfare in 1926 and held this post until 1941, when she left to write and to act as consultant to both federal and provincial governments on social services and welfare.

Controller of the City of Ottawa in 1950, she became mayor in 1951, the first woman mayor of a major Canadian city. She served from 1951 to 1956 and from 1960 to 1964, and was active in politics until 1972. Among the honors she received were the OBE (Order of the British Empire) in 1934, the OC (Service Medal of the Order of Canada) in 1967, and honorary doctorates from King's College, Halifax (1939) and Smith College, Massachusetts (1939). Charlotte became well known for her sometimes biting wit; she is said to have expressed her opinion of women's work in society succinctly in the words, "Whatever women do they must do twice as well as men to be thought half as good. Luckily this is not difficult." She died in Ottawa on 25 January 1975, a few weeks before her seventy-ninth birthday. See Queen's Archives, Charlotte Elizabeth Whitton fonds, <http://db.archives.queensu.ca/> (Nov. 2008).

297. *Queen's Encyclopedia*, Gordon, Wilhelmina, <http://qnc.queensu.ca/Encyclopedia/g.html#GordonWilhelmina>; "The Gordons. Gordon Family," www.queensu.ca/secretariat/catarauqui/frqueenplot.htm (both Aug. 2009).

298. Harris, *Higher Education in Canada*; A. G. Bedford, *The University of Winnipeg: A History of the Founding Colleges* (Toronto: University of Toronto Press, 1976).

299. Bedford, *University of Winnipeg*, 48, 51, 53; "Joseph Walter Sparling / Susannah Mary Weir Kerr," in Ancestry.com <http://freepages.genealogy.rootsweb.ancestry.com/~jksparling/d0010/f0001088.html> (Dec. 2008).

300. Ada Ducas and Janice Linton, "Women Working for Healthy Communities," Manitoba Women's Directorate, Women's History Month, October 2001, www.gov.mb.ca/wsw/publications/whm2001.html (April 2009); M. Ellen Douglass, "A pioneer woman doctor of western Canada—Dr. Charlotte Ross," *University of Manitoba Medical Journal* 18, no. 1 (1946): 13–16.

301. Ducas and Linton, "Women Working for Healthy Communities."

Comparisons and Conclusions

To present a more just and accurate picture of the contributions made by the women of these four colonial societies to European nineteenth-century scientific knowledge, it is necessary to include more than those whose work was indexed in the Royal Society's *Catalogue*. With their small European populations and, in the cases of Australia and New Zealand, the recent arrival of white settlers, these societies were appreciably behind Britain, the United States, and continental Europe in developing universities and research institutions.

The great interest in natural history, particularly botany, in nineteenth-century Britain and continental Europe meant that botanical material from the newly settled regions was much in demand. Botanists and museums were eager to acquire specimens, descriptions, and illustrations of previously unknown and often exotic plants; women collectors and botanical artists from among the settlers and the generation that followed were among those who worked to satisfy that demand.

Contacts with Britain were very important in all four colonies, not only as stimulus for collectors and illustrators in the earlier years of the century, but also later when Britain sent lecturers to fill newly established colonial university posts and when some of the first women botany students went to Britain for further training. Canadian women had the additional advantage of their country's proximity to the United States. The latter not only was the place of origin of the United Empire Loyalist (American loyalist) communities responsible for establishing some of the first colleges in Canada open to women, but thanks to its larger population and more advanced development also provided further training and, in some cases, employment opportunities.

The most remarkable stories emerging from this survey are those of the many individual women who contributed to the discovery and recording of the tremendous wealth of floral species in the newly discovered and only sparsely settled lands. Natal settler Katharine Saunders and Cape Town's academic botanist Edith Stephens are especially colorful and interesting characters; New Zealand's settler artists Georgina Hetley and Fanny Osborne of Great Barrier Island also stand out, as do several Australians, including Tasmanian Mary Allport and the widely known Ellis Rowan, whose subjects ranged from the delicate flowers of the western Australian desert to the exotic plants and birds of tropical New Guinea. Particularly notable in Canada are Catharine Strickland Traill, who recorded in both words and pictures the presettler scenery and plant life of the region along the northern shores of Lake Ontario, and floral artist Martha Black, who collected in the Yukon and British Columbia.

In all of these former colonies surveyed here, the late development of educational institutions, research facilities, and advanced training accessible to women to a large extent precluded women's participation in research likely to be reported in journals of the period indexed by the Royal Society. Nevertheless, the early women made significant contributions to the work of exploring and recording the plant life of their countries—although probably less so in Canada, with its vast area of inhospitable Arctic tundra, than in the three Southern Hemisphere countries with their tremendous wealth of exotic, unknown flora. By the early years of the twentieth century, universities having by then opened to them,

a few pioneers had moved on to laboratory-based studies, where they fully demonstrated their capabilities, despite prejudices they still faced. Outstanding examples are Maude Abbott and Margaret Newton in Canada, Edith Stephens in South Africa, and Georgina Sweet in Australia; but women of scientific bent in all these countries were showing themselves to be among the most enterprising, productive, and colorful people of their time. Their stories are well worth pursuing.

Bibliography of Papers in Scientific Periodicals, 1800–1900, by Women in Australia, Canada, New Zealand, and South Africa

Entries are from the *Catalogue of Scientific Papers, 1800–1900*, 19 volumes, compiled by the Royal Society, London (Cambridge, UK: Cambridge University Press, 1867–1925). The list has been supplemented by additional entries, enclosed in braces, { }. Most of these were collected from periodicals not examined by the Royal Society indexers: minor journals, regional journals of short-run, general-interest magazines, and journals in fields not covered in the *Catalogue* (such as agronomy and clinical medicine). For consistency, only entries derived from the *Catalogue* are included in intercountry comparisons of productivity. The *Catalogue*'s style of presentation and its nomenclature conventions have been retained for the most part. A key to abbreviations follows the bibliography.

AUSTRALIA

Botany

Hussey, Jessie Louisa

Hussey, (Miss) Jessie

{Catalogue of the native flora about Port Elliot. *S. Australia Roy. Soc. Trans.*, 21 (1897) 100}.

Martin, Flora M. Campbell

Campbell, (Miss) F. M.

Victorian fungi. [1886–1887] *Victorian Natlist.*, 2 (1886) 127 (*bis*) [139]; 4 (1888) 95–96.

Martin, Flora

A ramble amongst fertilizers. [1895] *Victorian Natlist.*, 12 (1896) 87–91.

Conchology

Kenyon, Agnes Fleming

Kenyon, (Mrs.) Agnes F.

Some conchological notes on Tasmania Mollusca. *Tasmania Roy. Soc. Proc.* (1896) 87

Notes on the effects of the atmosphere on the shells of Mollusca. *Tasmania Roy. Soc. Proc.* (1896) 88.

On the occurrence of callosities in *Cypraea* other than *Cy. bycallosa* and *Cy. rhinocerus*; and on the occurrence of a sulcus in *Trivia*. *N. S. Wales Linn. Soc. Proc.*, 21 (1896) 26–27.

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Note on *Cypraea caput-anguis*, *Philippi*, with the description of a new variety of *C. caput-serpentis*. [1898] *London Malacol. Soc. Proc.*, 3 (1899) 77–79.

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{Barriers to migration, and their effects as shown in the Australian region. *Victorian Natlist.*, 10 (1894) 135–42}.

Neurology

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Forster, Laura

Zur Kenntniss der Muskelspindeln. *Virchow, Arch.*, 137 (1894) 121–54.

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a'Beckett, Ada Mary Lambert

Lambert, Ada M.

The structure of an Australian land leech. [1897] *Victoria Roy. Soc. Proc.*, 10 (1898) 211–35.

Description of two new species of Australian land leeches, with notes on their anatomy. [1898] *Victoria Roy. Soc. Proc.*, 11 (1899) 156–63.

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Brennan, Sarah O.

On the reproductive system of *Digaster (Didymogaster) sylvaticus*, *Flech.* [1899] *N. S. Wales Linn. Soc. Proc.*, 24 (1900) 691–96.

Sweet, Georgina

Sweet, (Miss) Georgina

On the variations in the spinal nerves of *Hyla aurea*. [1896] *Victoria Roy. Soc. Proc.*, 9 (1897) 264–96.

On the structure of the spermiducal glands and associated parts in Australian earthworms. [1900] *Linn. Soc. J. (Zool.)*, 28 (1900–1903) 109–39.

Spencer, W. Baldwin; Sweet, Georgina

The structure and development of the hairs of monotremes and marsupials; Part I. Monotremes. *Quart. J. Micr. Sci.*, 11 (1899) 549–88.

Physics

Martin, Florence

Martin, (Miss) Florence

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ABBREVIATIONS KEY

Abbreviations follow the Royal Society *Catalogue* usage. For those periodicals not included in the *Catalogue* but added to the bibliography, a similar style of abbreviation has been adopted.

<i>Ann. Phys.</i>	<i>Annalen der Physik</i> , Leipzig
<i>Aust. Ass. Rep.</i>	<i>Report of the . . . Meeting of the Australian Association for the Advancement of Science</i> , Sydney, Melbourne
<i>Bot. Gaz.</i>	<i>The Botanical Gazette</i> , Crawfordsville, Ind.
<i>Cambridge Phil. Soc. Proc.</i>	<i>Proceedings of the Cambridge Philosophical Society</i> , Cambridge
<i>Canada, Bot. Soc. Ann.</i>	<i>Annals of the Botanical Society of Canada</i> , Kingston
<i>Canad. Ent.</i>	<i>The Canadian Entomologist</i> , London [Ontario]
<i>Canad. Hortic. Mag.</i>	<i>Canadian Horticultural Magazine</i> , Montreal
<i>Canad. Rec. Sci.</i>	<i>The Canadian Record of Science</i> , including the <i>Proceedings of the Natural History Society of Montreal</i> , and replacing the <i>Canadian Naturalist</i> , Montreal
<i>Canada Roy. Soc. Proc. & Trans.</i>	<i>Proceedings and Transactions of the Royal Society of Canada</i> , Montreal
<i>Curtis Bot. Mag.</i>	<i>Curtis's Botanical Magazine</i> , London
<i>Ent. Soc. Trans.</i>	<i>The Transactions of the Entomological Society of London</i> , London
<i>Gard. Chron.</i>	<i>The Gardeners' Chronicle</i> , London
<i>Hortic. Soc. J.</i>	<i>The Journal of the Royal Horticultural Society</i> , London
<i>J. Exper. Med.</i>	<i>The Journal of Experimental Medicine</i> , New York
<i>J. Path. Bact.</i>	<i>The Journal of Pathology and Bacteriology</i> , Edinburgh, London
<i>Linn. Soc. J. Bot.</i>	<i>The Journal of the Linnean Society: Botany</i> , London
<i>Linn. Soc. J. Zool.</i>	<i>The Journal of the Linnean Society: Zoology</i> , London
<i>Linn. Soc. J.</i>	<i>Journal of the Proceedings of the Linnean Society</i> , London
<i>Linn. Soc. Proc.</i>	<i>Proceedings of the Linnean Society of London</i> , London
<i>London Malacol. Soc. Proc.</i>	<i>Proceedings of the Malacological Society of London</i> , London
<i>London Path. Soc. Trans.</i>	<i>Transactions of the Pathological Society of London</i> , London
<i>Montreal Horti. Soc. Fruit Growers' Assoc., Rep.</i>	<i>Montreal Horticultural Society and Fruit Growers' Association of the Province of Quebec, Report</i> , Montreal
<i>Montreal Med. J.</i>	<i>Montreal Medical Journal</i> , Montreal
<i>N. Scotia Inst. Sci. Proc. & Trans.</i>	<i>Proceedings and Transactions of the Nova Scotian Institute of [Natural] Science</i> , Halifax, Nova Scotia
<i>N. S. Wales Linn. Soc. (Macleay Mem. Vol.)</i>	<i>Linnean Society of New South Wales, The Macleay Memorial Volume</i> , Sydney
<i>N. S. Wales Linn. Soc. Proc.</i>	<i>The Proceedings of the Linnean Society of New South Wales</i> , Sydney
<i>N. S. Wales Roy. Soc. J.</i>	<i>Journal and Proceedings of the Royal Society of New South Wales</i> , Sydney, London

- N. Zealand Inst. Trans.* *Transactions and Proceedings of the New Zealand Institute, Wellington, N.Z., London*
- Ontario Ent. Soc. Rep.* *Annual Report of the Entomological Society of Ontario, Toronto*
- Ottawa Natlist.* *The Ottawa Naturalist, Ottawa*
- Phil. Mag.* *The London, Edinburgh and Dublin Philosophical Magazine and Journal of Science, London*
- Philadelphia Med. J.* *The Philadelphia Medical Journal, Philadelphia*
- Phys. Rev.* *The Physical Review: A Review of Experimental and Theoretical Physics, New York, London, Berlin*
- Quart. J. Micr. Sci.* *Quarterly Journal of Microscopical Science, London*
- Quebec, Lit. Hist. Soc. Trans.* *Transactions of the Literary and Historical Society of Quebec, Quebec*
- S. African Phil. Soc. Trans.* *The Transactions of the South African Philosophical Society, Cape Town*
- S. Australia Roy. Soc. Trans.* *The Transactions of the Royal Society of South Australia, Adelaide*
- Science* *Science, Cambridge, Mass., New York*
- Sci. Opinion* *Scientific Opinion, London*
- Tasmania Roy. Soc. Proc.* *Papers and Proceedings of the Royal Society of Tasmania, Tasmania*
- Victorian Natlist.* *The Victorian Naturalist: The Journal and Magazine of the Field Naturalists' Club of Victoria, South Melbourne*
- Victoria Roy. Soc. Proc.* *Proceedings of the Royal Society of Victoria, Melbourne*
- Virchow, Arch.* *Archiv für Pathologische Anatomie und Physiologie und für Klinische Medizin: Herausgegeben von Rudolf Virchow, Berlin*
- Zeitschr. f. Akklimat.* *Zeitschrift für Akklimatisation, Berlin*

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