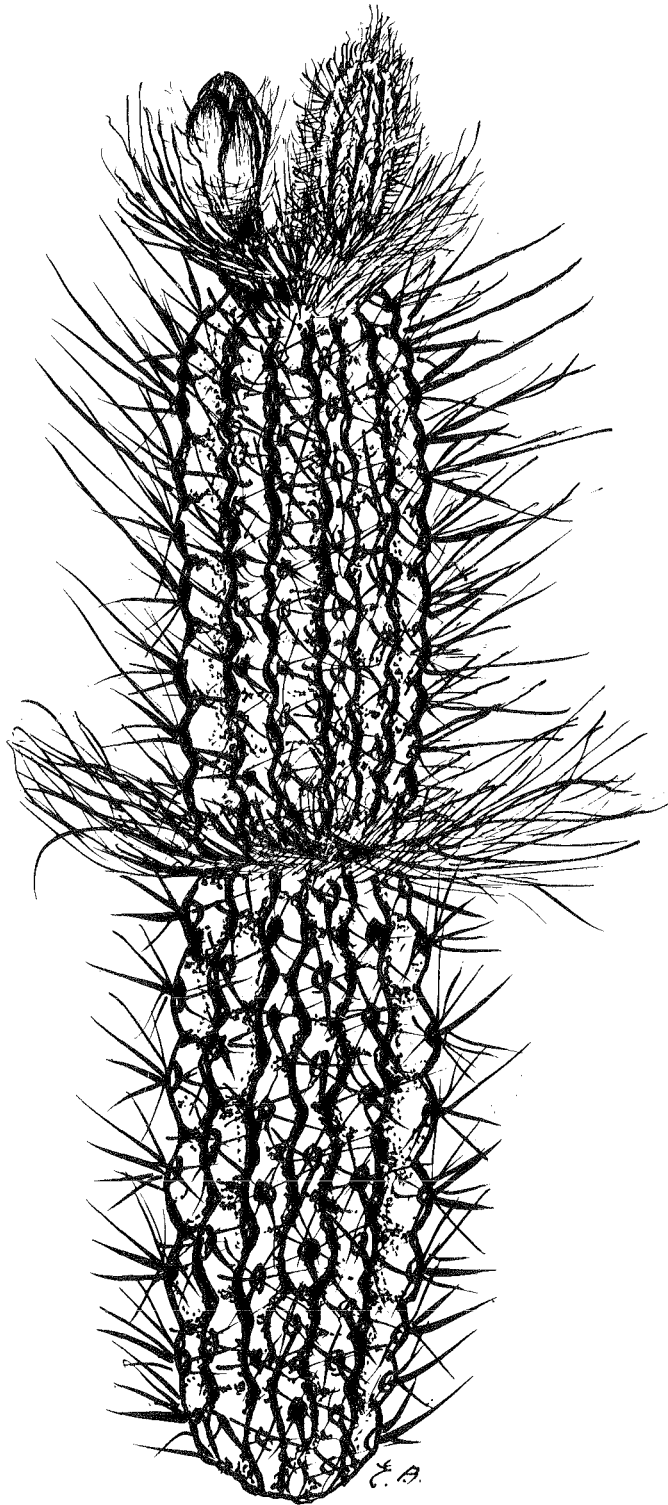
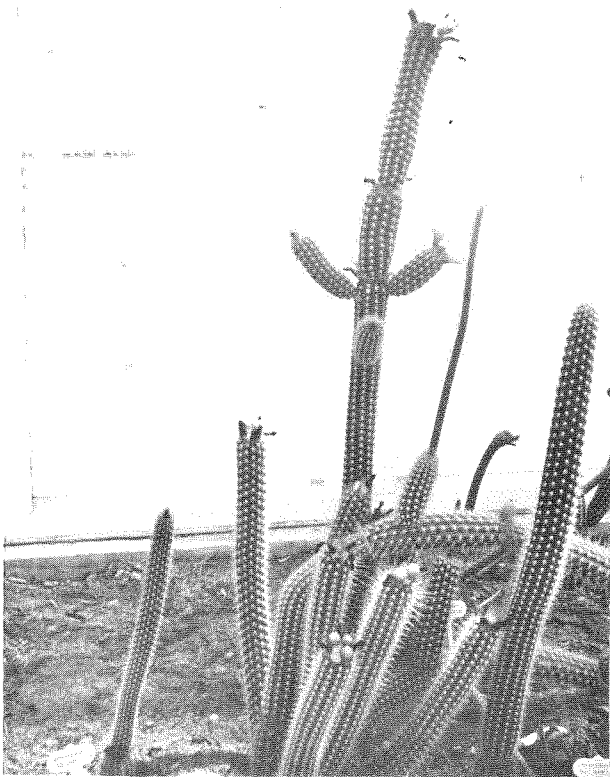


# THE CHILEANS '72

VOLUME 6 NUMBER 23

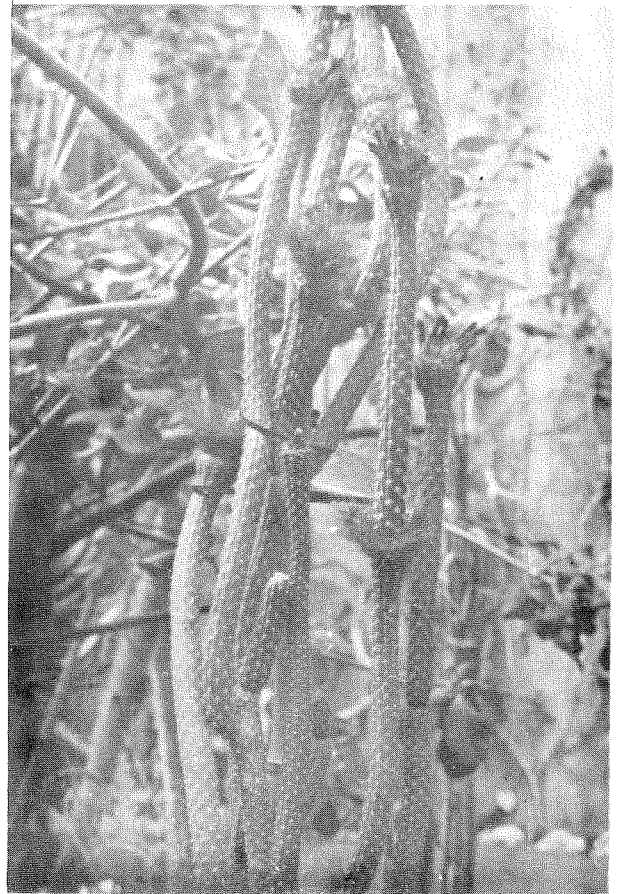


ARROJADOA CAFERNAUERSIS sp.n. HU 216  
Collection E.W. Barnes



*Arrojadoa rhodantha*

Collection - B. CHUDLEIGH  
Photograph - Mrs. L. MacINTOSH



*Arrojadoa penicillata*

Collection - J. MARNIER-LAPOSTOLLE  
Photograph - H. MIDDLEDITCH



*Arrojadoa penicillata*



*Arrojadoa rhodantha*

SEED  
K.U.A.S. 19.8:68

## ARROJADOA FLOWERS by B.J.Chudleigh

I have grown a number of Arrojadoas both from my own seed and imports from Uebelmann. These imports root extremely rapidly in warm weather and I have all of them growing in the ground in my main glass house.

One *A. rhodantha* is a plant obtained from Lex Fuau in Australia about ten years ago as an unrooted cutting, another is a seedling obtained in New Zealand about 7 years ago. I also have three forms from Uebelmann, HU 216, HU 225, and HU 208a, and two plants from an Australian collector as seedlings of *A. rhodantha* v. *minensis*. All are now much branched specimens which flower profusely.

Branching occurs from the base, the sides, and also occasionally from the cephalium which can produce 2 or 3 offsets although mostly only a single shoot comes from the cephalium. Their maximum height appears to be about 4 feet and at this height the branches become shorter and there is more branching from the base and sides. My plants vary from 2 to 3 feet in height but some of the upper branches were shortened last summer to keep them from getting top heavy and falling. I also find it necessary to prune as plants let grow are lanky and tend to sprawl. More branching means shorter, stiffer, growth whereas the very long branches tend to be flexible. The length of the branches is extremely variable, from 4 inches to 15 inches or more. Growth usually begins in late summer at the completion of the main flowering and most of it is made in a few months of autumn and winter, but there is often new growth at any month of the year. Strong growing plants rarely fail to put out new growth each year.

The best time to take cuttings seems to be mid summer as growths are well hardened and it is approaching the growing season; they are best removed at an old cephalium as there is less mutilation and new offsets will form at the point of removal. Cuttings are sometimes troublesome in rooting and occasionally take two years before shooting out through the cephalium.

Spine colour is mainly cream or pale brown, somewhat reddish on HU 216; cephalium bristles vary from pale brown on HU 225 and v. *minensis* to dark brown on locally obtained seedlings to deep red-brown on HU 216. The cephalium is slightly less in diameter than the stem. One point that interests me, does Arrojadoa really qualify as a cephalium-forming plant? It does not seem to me to be a cephalium in the true sense of the word.

All these plants are very much alike in flower, except those of HU 216 which are a little slimmer. They flower from spring to autumn - there will be almost constant flowering for 6 months of the year. Flowering often continues from old cephalium rings for two or three years after new growth has come through it. My Arrojadoas all seem to flower during the day, the flowers opening with the warmth of the morning. They stay open only a short time in the sun, but in dull weather they will stay open until late in the afternoon. They open for one day only. I have never noticed any insects on the flowers, although bees do get in the glasshouse occasionally. I rarely have seed set on my cacti unless pollinated by me but I am able to set seed on Arrojadoa without difficulty; they form seed pods similar in colour to the flowers, sometimes rather darker in shading and with a peculiar odour when ripe. The pod falls suddenly from the cephalium when it is ripe - it is not ejected as it only sits on the cephalium rather than in it. The pod does not split, but gradually dries up, much like *Echinocereus*, particularly the *pectinatus* group. These plants have taken temperatures down to 4 degrees below freezing this winter (June) but day temperatures are going up to the mid 70's or more on sunny days.

The seeds germinate easily and grow well with the temperature in the 70's. They seem to need heat the first winter or there are heavy losses. If kept moving, they can be flowered here in about 4 years from seed. They like a rich soil, heat, and plenty of water.

*Arrojadoa penicillata* is a completely different plant, naturally very thin and pencil like, it forms branches of 4 inches to over two feet in length which scramble all over the place and need some support. Mine get this from *A. rhodantha* and other tall growing cacti. Like *A. rhodantha*, they can be kept more upright by pruning to make them form more and shorter, stiffer, branches.

The flower is much different from that of *A. rhodantha* - which is like carved pink wax - being more loosely formed and more velvety in texture. The cephalium on this species is 3 or 4 times the diameter of the stem. My *A. penicillata* has not set seed, but I now have a second plant which is of another clone, which I hope should flower next summer.

Comments on *Arrojadoa*

..... from H. Middleditch.

"The writer poses the question whether *Arrojadoa* really qualifies as a cephalium-bearing plant. At our '72 National Gathering we did look at the basic question of "What is a cephalium?" and showed that it was hairy and/or bristly growth from the flower base prior to the actual appearance of the flower bud. Examples were shown on slides of plants where the formation of a cephalium growth commences right in the growing point of the plant and inhibits the growth of the normal thickness of body cells material outside the vascular bundle. Thus the areoles from which the cephalium of a *Melocactus* arises are closer to the vascular bundle than are the normal areoles - hence the cephalium is much less in diameter than the preceding body growth. Likewise the base of the cephalium hairs on an *Epostoa* is nearer the vascular bundle than the remainder of the areoles, and so the cephalium is set in a sunken groove running down the side of the plant. On *Micranthocereus*, *Thrixanthocereus*, and *Pilosocereus*, the woolly growth produced by the basal part of the flower prior to the appearance of the bud, takes place at a normal areole after it has been formed from the growing point. In consequence the areole remains at the normal distance from the vascular bundle and this form of growth is commonly described as a pseudocephalium. The nature of a pseudocephalium can range from the distinctive side cephalium on *Thrixanthocereus* which might appear to be superficially similar to a cephalium on an *Epostoa*, to the extra bristly growth found in the flowering zone of *Cephalocleistocactus* or *Seficereus*. And what about the extra heavy spine growth at the flowering areoles of *Notocactus caespitosus* - and every fine variation in between? So where you draw the line between what is a pseudocephalium and what is not depends on the observer's point of view. Backeberg obviously considered that *Cephalocleistocactus* could be considered to have a pseudocephalium, but other authors would not necessarily hold this view.

"If the plant produces the extra wool or bristles from the flower base right from the growing point, then it is a cephalium and the areoles will stand closer to the vascular bundle, so here we do at least have a distinct criterion which can be applied. Now in *Arrojadoa* we do know that when new terminal growth starts from the cephalium it commences with a fairly thin neck which does not subsequently expand the belt of cephalium areoles to the same diameter as the rest of the body. Thus the cephalium areoles remain sunken - and as such they constitute a cephalium. Just because it is small in extent does not make any difference to its botanical form. That little green weed called *Lycopodiodes* has a minute flower but when examined under a hand lens it will be found to be identical in construction to any other *Crassula* flower - the absolute size is not important. Likewise with *Arrojadoa*; if the extra hair and bristles are secondary axillary growth from the incipient flower bud (or cauline zone as Buxbaum describes it) - see the series of articles in earlier *Chileans* on "What is a cephalium?" - and the areole remains sunken, then the growth is indeed a cephalium. Similar growth is to be found on *Stephanocereus*".

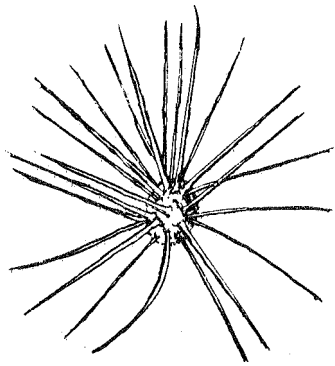
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THE GENUS *ARROJADOA* by Professor F. Buxbaum

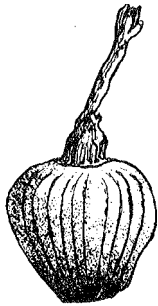
(Translated by H. Middleditch from *Die Kakteen* 1.VII: 1968)

The genus *Arrojadoa* is named in honour of the then superintendent of the Central Brazilian Railroad, Dr. Miguel Arrojado Lisboa. It was originally described as *Cereus rhodanthus* by Gurke in *Monatschrift Kakteenkunde* 18.69:1908).

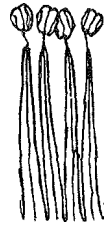
The diagnosis for this genus according to Britton & Rose runs as follows:- "Stems low, much branched, cylindrical; roots fibrous; ribs numerous, low, straight; areoles close together, bearing



AREOLE



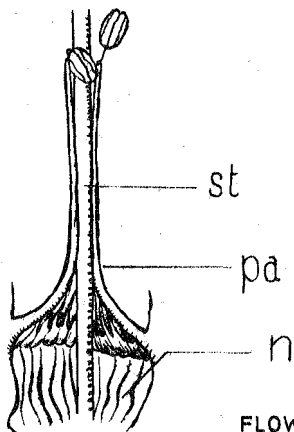
FRUIT



PRIMARY STAMENS

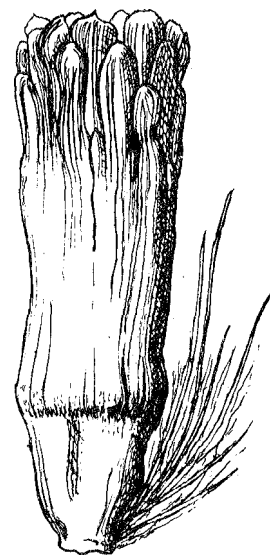
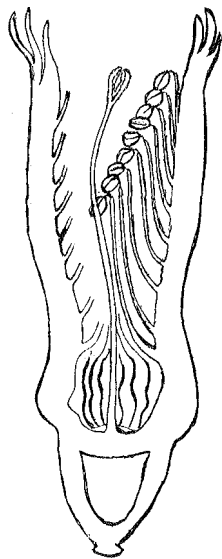


SEED



FLOWER SECTIONS

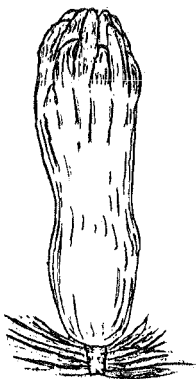
st - STYLE  
pa - PRIMARY STAMEN  
n - NECTAR CHAMBER



FLOWER

*Arrojadoa aureispina*

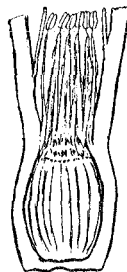
K.u.u.a.S. 23. 4:72



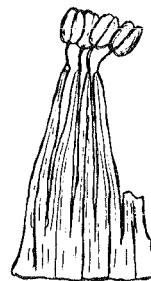
FLOWER



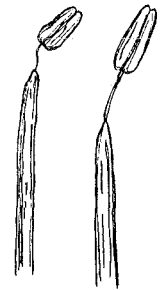
FLOWER SECTION



NECTAR CHAMBER & PRIMARY STAMENS



PRIMARY STAMENS



SECONDARY STAMENS

*Arrojadoa rhodantha*

BUXBAUM-KRAINZ DIE KAKTEEN 1.7:68

small acicular spines; flowers diurnal, borne in a pseudocephalium at the top of the stem or branch, small, red or pink, resembling in colour and size that of a large Cactus (Melocactus), nearly cylindrical, the tube short; perianth segments in several rows, short, erect; stamens and style included; fruit a small, oblong, naked, juicy berry; seeds small, black."

The type species *A. rhodantha* grows upright or somewhat decumbent or supports itself by leaning against other vegetation, branches from the base or higher up, branches slender or very thin stemmed column with joints, about 10 or 12 ribs, at the end of each joint generally more or less swollen. The spination acicular, mostly delicate. Radial spines very short and adpressed or stronger and not distinctly different from the central spines. The growing limb ends in a thickening with a true terminal cephalium (sensu Werderman) of thicker wool and brown bristles, that will be grown through again from the centre, or else the new growth branches off from a more outward lying areole. The cephalium remains as a bristly ring to retain and maintain its capacity to form flowers.

Frequently, several flowers appear to develop simultaneously, pink-coloured to red and almost cylindrical. Above the narrow pericarpel the petaloid coloured receptacle is more or less swollen in the region of the conspicuous ovoid nectar chamber and above that dilating in a slightly conical manner; it is naked and scaleless, only more or less fluted downwards from the base of the outermost flower petals. These are small, scaly, but coloured like the flower petals, the remaining flower petals lanceolate and lighter coloured, at full anthesis broadening out funneliform, the innermost somewhat shorter.

Above the nectar chamber is a thin axial projection which is split into very long, distended, flat, narrow triangular tongues - the lower part of the primary filaments. These stamens are collected together tube-like closely around the style and narrow at the end to the lowermost short, hair thin sharp end section. The other (secondary) stamens are inserted in the receptacle walls in fairly close rows as far as the throat; their length decreases from the throat downwards. Filaments relatively very large, cylindrical, also becoming sharply contracted into a short hair fine section close below the anther.

Style with straight, lengthy, papillose stigma lobes. Ovules on short placentae, branching sparsely close above the foot.

The slender, top shaped, sometimes more or less triangular, succulent fruit is smooth, almost translucent, whitish to red, with thin fruit walls; on maturity it becomes pressed out of the cephalium.

Seed small, irregular pear - to almost kidney-shaped with sometimes basal, sometimes sub-basal hilum, depending on the degree of curvature of the seed. Hilum an irregular oval encompassing the micropyle. Testa glossy black, the tubercles in the area of the keel large, oval and very sharply defined, passing to extensively flattened patches on the flanks, with tiny grooves on the cell edges.

Habitat: Brazil, in the Caatinga of Pernambuco, Piauhy, as well as central and southern Bahia, in the undergrowth.

The flower of *Arrojadoa* has no relationship to *Austrocephalocereus* in structure. After the long lost *Micranthocereus polyanthus* was again introduced and could be studied, it turned out that this genus and *Arrojadoa* are very closely related to each other.

The flower of *Arrojadoa* exhibits the similar, very unusual construction of the primary stamens, which form the union with the axial projections; in *Arrojadoa* however the acute triangular-shaped lower parts are longer and narrower and closed up to each other so tightly against the style that they can easily be observed. The difference between the flowers of the two genera is that in *Micranthocereus* the filaments of the secondary stamens are reduced to a hair thickness at the end part and that the flower of *Arrojadoa* in other respects is also even further reduced.

The formation of the stamens of *Arrojadoa* provides a connection with *Cleistocacti*. That same feature of the stamens - the hair thin, tapered end of the filament in contrast with the thick part of the filament is also found in *Cleistocactus tominensis* - a species in which flower hairiness is

particularly reduced. Whenever a similar formation of the filaments also appears elsewhere, this fact in conjunction with the rest of the flower structure quite plainly indicates a close affinity, since it emphasizes the unity of the morphological type of both genera.

In addition, the seeds of *Arrojadoa* belong to the same morphological type as those of *Micranthocereus* and are (like the flower) more primitive than *Micranthocereus*.

Britton and Rose state that this genus is day flowering. Werdermann emphasizes that in respect of *A. rhodantha*, it is only open in the full sunshine in the morning. Krahenbuhl comments however that his cultivated specimen of *A. penicillata* first opens fully around 2200 hours. Whether a species distinction exists here or only the influence of the external circumstances, remains to be further investigated.

#### Comments on *Arrojadoa*

..... from H. Middleditch.

"In the description of the flower of *Arrojadoa*, Buxbaum refers to the thickened basal part of the primary stamens narrowing at the end to the "lowermost" short, fine, end part. This is a literal translation which is not altogether clear to me, unless one reads "base of" instead of the word "lowermost", when it becomes quite clear that the thick part of the stamen is joined to the bottom of the thin part of the stamen.

"Later on in his article, Buxbaum refers to the thickened basal parts of the primary stamens leaning so close to the style that they can be easily observed - presumably he means that they can easily be seen when one looks down into the open flower."

..... from R. Moreton

"I would prefer to see the German word "achsenvorsprung" translated not as "axial projection" but as "hymen", to describe the serrated membrane formed by the swollen bases of the primary stamens. This membrane cannot in fact be seen when looking down the tube of the flower because the flower is so full of stamens."

..... from H. Middleditch.

"I see from Marshall and Woods "Dictionary of Succulent Plant Terms" that the word "hymen" comes from a Greek word meaning membrane and so would seem to be a suitable term for the fused thickened bases of the primary stamens".

..... from E.W. Barnes

"My *Arrojadoa cafernauersis* n.n. flowered in September last year for one evening only. When I say 'opened' I mean that the petals expanded a little and that is all. Maybe if the weather had been warmer they would have expanded more. I believe that *Arrojadoas* are quite capable of producing flowers from the older cephaliums lower down the stem. I certainly discovered quite a 'new' looking seed capsule in the cephalium below the terminal one. There were also three seed capsules in the terminal cephalium which looked about the same age as the previous one mentioned.

"The flowers were preceded by new growth, whether this was just an indication that the plant was coming to life again and had enough energy to flower I do not know. The new growth and the flower can be seen side by side on my sketch. I am sure that flowers are normally produced before a new shoot begins to form and the behaviour of my plant is no true indication of the behaviour of similar plants in habitat."

..... from P.H. Sherville.

"In September 1970 I purchased from New Mexico Cactus Research some seed of two species of *Arrojadoa*, *A. rhodantha* and H.U. 225. The seed was sown in vermiculite and a high percentage of rapid germination resulted. The seedlings never looked back and progressed faster than any of the other *Pilosocereus/Cephalocereus* seedlings, although even in conditions of constant high temperature and humidity they still developed purple/brown patches - apparently without suffering any harm. The seedlings of HU 225 seemed to be more prone to this blight, whatever it is.

"My surplus seedlings have gone into the Chileans seedling pool; the remaining three specimens of each species are now (May 1972) some 7 to 9 inches high and are developing basal offsets - the main growing point being undamaged and viable in each plant. The HU 225 seems to be more prolific with offsets than *A. rhodantha*."

..... from R. Moreton.

"My first contact with *Arrojadoas* was in growing them from Ritter's seeds several years ago. Seed of *A. rhodantha* and *A. penicillata* germinated readily and the resultant seedlings were very quick growing, being about 8 cm. high after one season's growth. Unfortunately I then had to go abroad, but I did not anticipate trouble with plants of that size during my absence and I left them in the cool house (45°F). When I returned in the following spring, I found that all the *A. penicillata* were dead and the *A. rhodantha* not much better. I concluded that next time they would have to be kept in the warm house, at 55°F minimum. Regrettably, as far as *A. penicillata* is concerned there never has been a next time as the seed has never been offered since, or at least seed of that name has produced plants much nearer *A. rhodantha* than *A. penicillata*. Plants from the Ritter seed of *A. penicillata* were extremely slender, being no more than 4 mm thick.

"Seed of *A. rhodantha* has been fairly readily available and - given warmth - the seedlings made good progress, the largest so far being about 30 cm tall at four years of age. The growth so far has been entirely of the first stem section, with no sign of flowers and the subsequent jointed growth.

"Three years ago I received an imported piece of *Arrojadoa* sp. HU 251. This rooted readily and surprised me by continuing to grow during the first autumn and winter, producing a second joint some 20 cm long. Buds started to form but did not develop. During the second summer, growth was much slower, but possibly the new growth thickened somewhat.

"I have now joined Clive Innes at Holly Gate and HU 251 was added to the reference collection. This May, flower buds again formed and slowly developed into the characteristic *Arrojadoa* flowers, being of a very waxy texture and rose-pink in colour. Flowers have appeared not only at the end of the new growth, but also on the previous joint and away from the cephalium area of the new joint. The flowers open at night and close again at around 9.30 a.m. They are very long lasting (more or less two weeks) and then when they die, instead of shrivelling up, as with most flowers, they quickly turn black, remaining fleshy, before dropping off. This one plant has been almost continuously in flower since May, with a maximum of eight flowers being open at one time. Of all these flowers, just one has produced a seed pod containing viable seed. I will not give any further description as this species has been now described as *A. canudosensis* in the *American Cactus and Succulent Journal* for May/June 1972 and agrees in all respects.

"Some other plants received recently at Holly Gate, from our own collector in Brazil as *Arrojadoa* sp. *Canudos* appear to be the same species. We also have what appears to be another new species with joints 1 cm in diameter and covered in chestnut-red spines, which is at present unidentified.

"To summarise, it appears that *Arrojadoas* are easy to grow from seed or from collected plants, given a little extra warmth in winter, and they deserve to be more popular."



..... from A.W. Mace

"I have seen the plant of *A. canudosensis* in flower at Holly Gate and can confirm that the flower colour is much paler than other species which I have seen - also confirmed by the illustration in the American Journal.

"This year one of my *Arrojadoa* in addition to flowering from the cephalia also produced flowers from areoles near the top of a joint but apparently away from the densely bristled cephalium zone. The areoles carrying these flowers showed a few extra bristles and slightly longer spines. This plant - *A. horridispinum* n.n. - and another sp. nov. is indistinguishable from *A. rhodantha* to me. *Arrojadoa caferensis* n.n. HU 216 seems to be yet another spine variant. The new *A. aureispina* seems to be a yellow spined variant only, although I have yet to see flowers on this one. Another new plant *A. eriocaulis* n.n. HU 349 is very different, having thin stems (like *A. penicillata*) but covered in white wool.

"All the *Arrojadoas* I have had in flower seem to open their flowers very early in the morning - somewhere between 2 a.m. and 6 a.m. - and stay open until mid morning. I cannot comment on the flower structure, never having cut one open, but agree fully with the observations as far as the external appearances are concerned.

"*Arrojadoas* seem to be of reasonably easy culture providing they are kept reasonably warm in winter - say 10°C - although they seem to be subject to a rather special kind of black rot from the base during winter. However it seems to be reasonably easy to prevent it spreading by cutting the plant at a cephalium joint.

"I feel that the popularity of *Arrojadoas* is going to cause a rapid explosion of unjustified species names over the next couple of years, as has occurred in other groups.

..... further from H. Middleditch

"In his description, Buxbaum refers to *Arrojadoa* as "supporting itself against other vegetation". The photograph of *A. penicillata* in the collection of Marnier-Lapostolle depicts a plant growing in this very manner. The long, dense cephalium bristles are in marked contrast with the New Zealand grown specimen of *A. rhodantha*. One may perhaps discern the thickening of the stem on *A. penicillata* just below the terminal cephalia, again in marked contrast with the example of *A. rhodantha*. The illustration of *A. penicillata* taken from the German Cactus Journal would seem to show the flower slightly wider open than the illustration from K.u.a.S. of the *A. aureispina* flower. The slides of *A. rhodantha* type plants in flower seen at our National Gathering were also not as far open as the accompanying illustration of *A. penicillata* flowers.

"The print of the seeds of *Arrojadoa* on the inside front cover shows quite well the extent of variation that one may find in the seeds of any one cactus species, not only in size but also in some of the finer details of shape; at the same time, it also shows fairly well the consistency of the basic shape, the character of the testa and relative size of the hilum. The background to this print is of 1 mm squares, which affords a very handy way of measuring seeds with a fair degree of precision.

"The accompanying sketches show, amongst other features, the serrated hymen formed from the base of the primary stamens. The sketch of the secondary stamens depicts those of *Arrojadoa* as 'A' and those of *Cleistocactus tominensis* as 'B'. The similarity referred to by Buxbaum is self-evident.

"During the course of our National Gathering there was some discussion on the precise method adopted by humming birds for abstracting nectar from *Arrojadoa*, *Mircranthocereus* and *Cleistocactus* flowers; perhaps a search through literature may reveal some still photographs or descriptions of how humming birds do feed."

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We have slides of *Arrojadoa* both in flower and in fruit - A.W.C.

ARROJADOA AUREISPINA Buining et Brederoo spec. nov. by A.F.H. Buining and A.J. Brederoo  
(Translated by H. Middleditch from K.u.a.S. 23.4.72)

Corpus ex basi germinans ramis verticaliter surgentibus, 0.75 - 1 m altum, viride, ramis 5 - 5.5 cm diam., radicibus ramosis; in vertice cephalium saetosum flavescens existit in quo flores fructusque adolescent; costae 14, 1 cm inter se distantes, 6 - 7 mm altae, hebetiores; areolae in altitudinibus parvis costarum sedentes, paulo applanate rotundae, 4 mm latae, 3.5 mm longae, primo pilis longioribus griseo-albis instructae, diende brevi-tomentosae ad nudaes, 7 - 8 mm inter se distantes; spinae in vertice plus minusve sicut in penicillo et distantes, ibique acuminibus fulvis flavae sunt, deinde flavae ad flavescentes, denique multo posterius acuminibus brunneis albescentes; marginales 12 - 13, tenuiores sed pungentes, circiter 8 mm longae, radianter distantes; centrales circiter 9, paulo crassiores, circiter 14 mm longae. Flores tubiformes, 31 mm longi, maxime 10 mm diam., nudi, atro-rosei; pericarpellum 7 mm longum et 6 mm latum, coniforme, viridescenti-roseum; receptaculum 15 mm longum, 6 mm diam., paulo striatum, atro-roseum; folia perianthii exteriora 1.25 - 4 mm longa, 0.50 - 2 mm lata, acuminibus tenue crenatis, atro-rosea; interiora 2.5 mm lata, 4.5 mm longa, acuminibus tenue crenatis, atro-rosea; camera nectarariae 4 mm longa, 3.5 mm diam., staminibus plus minusve clausa; stamina primaria 10 mm longa, applanata, cum basi dilatata concretaque coronam super cameram nectaream fingunt, stamina numerosa reliqua sursum breviora ad 6 mm longa sunt; omnia fulvis thecis alba sunt; pistillum 22 mm longum 0.8 mm diam., fulvo-album; stigmata 6, 2.5 mm longa, tenuissima, alba; caverna seminifera 4 mm longa, 2.5 mm lata, coniformis, ovula praeter parietem interiorem bina in placenta ramosa, maxime 4 ovula in placenta singulo. Fructus 16 mm longus, circiter roseo-ruber, levis. Stemen piri- ad reni- forme, nitide nigrum, 1.1 - 1.2 mm longum, 0.7 - 0.8 mm latum; testa loculis maioribus, plus minusve rotundis concavisque qui ad hilum verticaliter instructi, minores et magis applanati sunt, oblecta; hilus a basi, minimus, 0.5 mm longus, paululum hamatum, cotyledones vix discernendae.

Habitat: inter septentriones et occasum solis Caitite, Bahia, Brazil, in altitudine circiter 200 m.

Holotypus in Herbaria Ultrajecti sub nr. HU 154.

Body branching from the base, stems rising vertically 0.75 to 1 m high, 50 - 55 mm diameter, green, with branching roots, forming a yellowish bristly cephalium in the apex, in which the flower and fruit are developed (it seems that they also flower from an old cephalium). In the next growing season the growing point grows through the cephalium and terminates some 15 cm further on with a new cephalium; ribs 14, up to 10 mm apart, 6-7 mm high, rather blunt; areoles placed upon a quite small elevation of the ribs, somewhat round and flattened, 4 mm broad, 3.5 mm long, at first with greyish-white, fairly long, somewhat curly woolly hairs, later with short felt to naked, 7-8 mm apart.

Spines in the crown more or less bunched up like a brush; outstanding and golden yellow with golden brown tips, later golden-yellow to yellow, later whitish with brown tips; radial spines 12-13 rather thin, but sharp, straight, ca. 8 mm long, radiating outwards; central spines ca. 9, somewhat thicker, ca. 14 mm long. Flower tubular, 31 mm long, up to 10 mm diameter, distended to 8.5 mm and globular at the nectar chamber, naked, dusky pink; pericarp 7 mm long, 6 mm diameter, naked, greenish pink; receptacle 15 mm long, 6 mm diameter, naked, somewhat fluted on account of the descending outer perianth leaves, dusky pink, outer perianth leaves 1.25 up to 4 mm long, 0.50 - 2 mm wide, upper edge delicately serrated, dusky pink; inner perianth leaves 4.5 mm long 2.5 mm wide, upper edge delicately serrated, dusky pink; nectar chamber 4 mm by 3.5 mm diameter, more or less closed off by the filaments; the primary filaments 10 mm long, flat, form with the broadening and coalescing of their bases a ring above the nectar chamber and lie in an arc against the style, whereby the nectar chamber becomes well-nigh or entirely closed.

The remaining filaments in the inner receptaculum are parallel with the style, those situated above becoming shorter over up to 6 mm upwards. All filaments terminate in a hair fine thread on which the anther sits; style 22 mm long, at the base 0.8 mm thick, yellowish white; stigma lobes 6,

2.5 mm long, very slender, curved inwards at the top, white; ovary conical, 4 mm long 2.5 mm broad; seed strings (funiculi) set along the inner wall in pairs, at the most four funiculi to each branch.

Fruit cherry-like, 16 mm long and broad, glossy, pinky-red; seed pear - to kidney-shaped, 1.1 to 2mm long, 0.7 - 0.8 mm broad, flat and straight at the foot, glossy black; testa composed of fairly large, more or less rounded, domed cells, towards the hilum becoming smaller and flatter and disposed vertically; hilum at the base, very small, 0.5 mm long. Micropyle and funicular opening readily perceptible. Embryo without perisperm, weakly crooked, cotyledons barely perceptible.

Occurrence: North-west from Caitite, Bahia, Brazil, at about 200 m, together with *Melocactus* and a *Zehntnerella* species and bromeliads. It grows there upon rocks and probably occurs only very locally and in a restricted area. These handsome, golden-yellow spined plants were found by Leopold Horst and Buining on the 19th December 1966.

Comments on *Arrojadoa aureispina*

..... from E.W. Bentley.

"Having perused the original German version of this article, I find the sentence about the shortening secondary filaments rather difficult, but I would think that it means that the filaments concerned are spread over a distance of up to 6 mm."

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THE CEPHALIUM-BEARING CACTI OF BRAZIL - 4 by F. Ritter.

(Translated by R. Moreton from *K.u.a.S.* for June 1968)

(A continuation of the table appearing in *Chileans* No. 13 & No. 22).

#### ARROJADOA

Form.	Cerei with terminal cephalium $\frac{1}{2}$ - $1\frac{1}{2}$ m high, solitary or branching at the ground or sometimes higher. Soft fleshed.
Ribs.	Numerous, low, crenate, rounded.
Cephalium.	Terminal: fineness and thickness of wool as in <i>Micranthocereus</i> , but white. Bristles numerous, fine long cephalium often grown through by new growth.
Areoles.	Thick.
Spines.	Rather numerous, needle like, straight, less flexible.
Flowers.	Either midday (rhodantha) or afternoon (penicillata) or close to sunset (sp. nova), rather small, straight.
Ovary.	Round without construction above, scaleless.
Nectary.	Rather long with some projection.
Tube.	Scarcely funnelform, longer than the nectary, only some fleshy scales above.
Stamens.	Basal stamens thickly arrayed, thickened, forming a diaphragm; above this with little or no gap all anthers near the style.
Petals.	Short, upright, outer ones very fleshy, inner shorter and thinner; only slightly expanded. Colour red. Flower does not dry up, but rots.

- Fruit. Clavate to beech-nut shaped, blunt below, furrowed longitudinally, not wrinkled, red; flat above; naked; the area bearing the dried flower remains takes up almost the whole width of the end of the fruit. Receptacle several mm deep. Wall very thin; skin not refractive of light. Fruit not explosive. Flesh slimy, sweet, white, not transparent.
- Seeds. Shining, fine and thickly tubercled. Hilum oval, slanting.
- Distribution. Pernambuco, Bahia north of Minas Gerais. Five species are established (previously 2 were known), the three new ones isolated from the others.

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NOTOCACTUS CAESPITOSUS (Speg.) Backbg. (Synonym *Notocactus minimus* Fric et Krzng. ex Buin) by D.J. van Vliet.

(Translated from *Succulenta* 49.6:70 by J.R. Chapman).

Although *Notocactus caespitosus*, in contrast to its small dimensions, for some time raised big questions, so much is known of this plant now that it hardly seems worthwhile to write more about it. Yet there is one aspect which until now, in my opinion, has been insufficiently explained. From the title of this article it is easy to deduce that authors were very divided over the correct nomenclature of this species and rendered even more silent by Backeberg and Osten who, from their published photograph, appeared to have mistaken a form of *Notocactus concinnus* for *N. caespitosus*.

The question which puzzled me was how *N. caespitosus* had obtained its name, which translated means clump-forming.

The plant that I had in my possession about 1960 came from Czechoslovakia and was a direct descendant of Fric's plant. In those days it was still called *N. minimus*. It could in no way confirm the 10-40 heads which Spegazzini produced in his description. However, it is evident that this plant is still identical to, although paler than, the latest imports of this species.

In the winter of 1966-67 Buining and Horst made a journey into the border territories of Uruguay and Brazil. Buining reported their discovery of *N. caespitosus* in *Succulenta* 9.1967 pp. 131-134. In that publication he officially reduced *N. minimus* to a synonym of *N. caespitosus*.

I received a few examples of the plants brought back by him and yet these still could not convince me of the above-mentioned features, since all the plants were solitary and exhibited no scars where offsets had been removed.

In 1968 I finally made the trip to Uruguay myself and found *N. caespitosus* in large quantities in various growing places. The first plants found were carefully dug out of the ground and I soon discovered the confirmation of the form of the many offsets that had given Spegazzini occasion to name the plant *Echinocactus caespitosus*.

However, the offset formation is somewhat different to what one would have supposed and which previously had led me to doubt whether this feature did exist. Therefore I think it is useful to describe this phenomenon. It occurs underground. This characteristic is shared by a few other cactus species from the same region as *N. caespitosus*. These are *N. ottonis*, *N. megapotamicus*, *N. linkii*, *G. leeanum*, *G. uruguayense* and *G. artigas*. The roots of the offsets are frequently larger than those of the mother plant.

As Buining remarked in his article, I will conclude by confirming that *N. caespitosus* is very variable in both form and colour of the spine. Among the plants which I brought back are to be found some very handsome and interesting forms.

Comments on *N. caespitosus*

..... from H. Middleditch.

"The article referred to by van Vliet which had previously appeared in *Succulenta*, written by A.F.H. Buining, was published in *Chileans* No. 15 pp 88-91.

"From my own experience I can confirm that at least one other *Notocactus* exhibits this feature of producing offsets from the root stolons - a specimen of *N. megapotamicus* obtained from Uhlig.

"The suggestion by van Vliet that it is now difficult to write anything more worthwhile concerning this species, rather surprises me. As has already been suggested in these pages, we lack information on the flower, fruit, and seed morphology in sufficient detail to enable a comparison to be made with other species of *Notocactus*. In addition I have heard very few comments regarding the growing of this plant from seed and its cultivation on its own roots; those comments which I have received might suggest that this species is perhaps not quite as amenable to cultivation as most *Notocacti*."

..... from A.W. Mace.

"I have had two plants of this species on their own roots and both passed away during their first winter - whether through lack of water or the low temperature I cannot say. I have now a grafted plant which has a number of heads".

..... from Mrs. L. Glass.

"I have a plant of *N. minimus* which I bought from Uhlig in 1969; I cannot be certain that mine is an imported plant in the sense that it was "collected". My brief entry on receipt records one plant with offset and one without, both with poor root system. My recollection is that they looked more like collected plants than grown from seed and the state of the roots would tend to confirm that don't you think? I had seen a photograph of the plant in flower during a talk at a Branch meeting which was why I sent for the plant when I saw Uhlig's list.

"Yes indeed, there were rooting problems. The more likely-looking plant was in fact dead after three months, whereas the other had by then grown and was looking well - that was the plant without an offset. This plant is now 35 mm high and 15 mm diameter, spines nice and dense, hooked centrals - but no flowers yet !"

..... from Mrs. M. Leach

"I can remember paying one guinea for my plant of *minimus* in 1967 (an unaccustomed extravagance at the time) and thinking that it was about a shilling a millimeter - in other words 21 mm high then. Growth is certainly slow. It was shortened a little by surgery in 1969 when it lost its roots and the measurement from the waist which then formed to the top ( $2\frac{1}{2}$  years' growth) is now 48 mm. It is roughly cylindrical in shape, diameter about 25 mm with 16 ribs spiralling slightly clockwise.

"Despite the slow top growth there was no trouble or delay in re-rooting and I do not really feel that the plant is "delicate". The colour I would describe as bright, light green rather than pallid, the lightness being enhanced by the radials (about 20) silver at first, changing to pale straw later. The three central spines are red with a pale tip at first, later changing to a deep dull red for their whole length. They are about 5 mm long, and some are slightly hooked at the tip. However, those from areoles which have flowered, and from the areoles which got extra woolly and looked as though they might produce a bud but didn't, are considerably longer - up to 15 mm.

"This plant flowered for the first time in July 1969 and each year since - never more than two flowers, and no seed was set.

"All my plants are in the same mixture - 50/50 John Innes No.2 and sand by volume - which seems to suit them reasonably well with the exception of the *Notocacti*. These are looking more and more miserable and I shall have to experiment with some different mix, or feeding, to try and improve them.

"I have just repotted my *N. minimus* and found 5 offsets just below the soil surface - I think that they would be termed stoloniferous".

..... further from H. Middleditch.

"The offsets arising from the special type of root - or stolon - as described by Mrs Leach is exactly the same characteristic as found by Van Vliet in habitat and described by him in his article.

"Last summer I happily had a flower on my plant labelled *N. minimus* and one on the plant labelled *N. caespitosus*. The stamens on *N. minimus* appeared to be quite short, pointing inwards towards the style, not quite reaching up to the stigma. On *N. caespitosus* the stamens appeared to be growing upright in the flower tube and came up level with the stigma lobes. I suppose that I should have checked both flowers, each day that they were open to see if the stamens changed from being bunched up and became sprout out, or grew in length, during the time the flower was open, as I have observed does occur on other flowers".

..... from C. Webb.

"My small specimen of *Notocactus minimus* was an imported plant from Uhlig in 1967; I did not quite pay a guinea for my plant but recollecting the size, I would think that a shilling a mm was about right. It was somewhat of a problem to root, losing its roots completely in the spring of '68; the bottom of the plant had to be dried off after that and then it was re-rooted without any trouble. It has hardly grown much more than the original size as I received it, for it is now about 22 mm high and some 8 mm diameter.

"At the odd intervals when I am able to take a look at my collection I often take the opportunity to loosen the very topmost layer of soil around the plants, most of them receiving this attention from time to time. When loosening the top soil around my *Noto. minimus* a couple of years ago, I discovered what appeared to be a small seedling plant virtually just below the surface. At first I thought that this must have been a self-sown seedling from some other plant, but after a bit more gentle poking around I found the tiny root which joined it to a stolon from the main plant body. Later on the offset produces its own hair roots. When the offset was removed from the pot to be planted up separately, the connecting root to the main stem was still turgid and had to be snapped off.

"One of these offsets which has been removed and potted up separately has attained a similar size to the original imported parent plant - the use of loam without an infusion of Hampshire chalk might have helped in this. The plant has produced a series of these offsets now, all of which have appeared out of the soil away from the base of the plant, one or two having appeared right against the edge of the pot. My *Notocactus megapotamicus* also produces stoloniferous offsets, but these bunch up tight against the parent plant body.

"My *N. minimus* produced a flower for the first time in 1969 and has flowered each season since - on one occasion only it had two flowers the same year - in each other year, just the one flower. They seemed to take a lot of strength out of the body of the plant, which is visibly shrunken by the effort of producing a flower - probably due to the great increase in transpiration when the flower is open. My considerable satisfaction at the first flower did not deter me from seeking out a nice sharp razor blade to cut the flower in half and examine it in section.

"This enabled me to see that the filaments were inserted from near the bottom of the tube,

up over the whole of the inner wall of the tube almost up to the base of the petals. This arrangement of the filaments was quite different from that which I observed in one or two other *Notocactus* flowers which I sectioned at about the same time. The stamens drooped towards the style, the stigma lobes being above the uppermost stamens. The pericarpel was yellow with green scales 2 mm long and 1 mm wide, having 8 or 9 red brown bristles 4 to 6 mm long in their axils and a little creamy brown hair. The petals were yellow with a faint to deep pink median band towards the tip of the outside of the outer petals. The flower was fairly large, being 40 mm long and wide.

"The body of the plant carries numerous pure white star-like radial spines and the centrals are a glossy reddish colour all the way through - a colour which is retained with age, the tip of the central being bent rather than hooked."

..... from D. Angus

"I sent for a plant of *N. caespitosus* from Su-ka-flor in 1970; on arrival I had great difficulty in locating it amongst the small consignment of plants for it was almost lost amongst the wrapping and packing papers. When I finally discovered it, the plant turned out to be under 10 mm broad and of similar height. I could hardly believe that anyone would even seek out such a minute specimen in a nursery and send it off, especially as I had paid the princely sum of 12 Swiss francs for it (not far short of thirty shillings). So I suppose it must have cost me the awful price of three shillings a mm or just over.

"This tiny specimen was somewhat carrot shaped and hanging from it was a white thread with a little lump on the end; looking closely at this tiny lump I found that the impossible had been achieved - this miniature lump was an even smaller version of the large (!) plant. More in sorrow than in anger I potted it up, using a mixture consisting mainly of peat which had weathered out of doors for an appreciable time - well over a year. This mix must have suited the plant for the main head is now round about 1½" tall, with three offsets growing just clear of the body, the smallest of these being about 10mm broad and high - thus slightly larger than the original head on receipt.

"Each areole carries numerous fine whitish radial spines and two centrals, one pointing somewhat upwards and the other somewhat downwards, these being stouter than the radials (but still very slender), dark reddish brown with horn-coloured tips, the colour being retained on older spines; the tips of the centrals are just faintly curved. The plants which I have seen which originated from Uhlig have a far more marked bend or hook to the tip of the central spines.

"This spring (1972) two spines, about twice the length of the normal central and rather stouter - but of similar colour - have appeared quite suddenly, growing almost straight upwards on the crown of the plant. Shortly afterwards the fluffy white bud could be seen developing at the base of these particular spines, so it looks as though I might be going to see it in flower."

..... from T. Lavender.

"I do not think that this production of extra-long spines at a flowering areole is confined to this species of *Notocactus*. I have observed that on *N. ottonis* the spines tend to be longer when they grow on flowering areoles. Indeed, *N. scopia* and *N. scopia* v. *glaucertianus* are rather similar in this regard."

..... further from H. Middleditch.

"The above comment makes even more interesting reading if it is taken in conjunction with those made by David Lewis on the seeds of these species, in the article in No. 22 on *Notocactus* seeds.

"Thinking about the various comments in Buxbaum's article entitled "What is a cephalium", concerning the tendency for flowering areoles to produce extra spine or bristle or hairy growths, one may think of the aforementioned examples in *Notocactus*, of the extra bristles on *Seticereus* or *Cephalocleistocactus*; of the very spiny and hairy crown on a flowering *Morawetzia*, and finally of the terminal cephalium on *Arrojadoa* and the side cephalia which appear in various genera. It would seem from this that a cephalium is the extreme form of a mode of growth which appears to a lesser degree in many other cacti plants."

..... from J.D. Donald.

"Like Dirk van Vliet I too was fortunate enough to receive plants of the Buining-Horst expeditions, and amongst them were examples of *Notocactus caespitosus*. These were mostly single heads (detached offsets) and fairly small in size - just over 15 mm in diameter - but there was a larger plant about 30 mm tall and 15 mm wide that had three stoloniferous offsets with their own roots. The connecting portion was like a thick root some 3 mm in diameter and about 25 mm long. I had no difficulty in establishing the plants, which quickly rooted with the larger plant producing a flower in its first season. The flower was remarkably large for the size of the plant that produced it, when fully open (perianth flattened and disc-like) it was some 50 mm across with a tube about 35 mm long and up to 10 mm wide. The perianth segments were broadly lanceolate, pure yellow in colour for the innermost segments, yellow with faint pink margins for the outer segments. The tube was typically crowned with long brown hairs. The shape of the flower-tube suggested that it belonged to the "ottonis" section. Fruits formed on all the plants in subsequent years and these again were very similar to the "ottonis" group.

"Only one plant showed any real tendency to form hooked centrals on its own roots, but one of the originals which I subsequently grafted (after losing its roots over winter!) also proceeded to develop hooked spines. All those on their own roots sooner or later produced stoloniferous offsets but the grafted plant has failed to produce normal offsets, instead it has grown very considerably into a long cylindrical plant about 120 mm tall and 35 mm wide. It flowers much more profusely than those on their own roots. Seedlings from home produced seed develop rather slowly - much more slowly than other species of *Notocactus*, apart from *N. rechensis* and *N. alacriportanus*, which are also rather slow. Even so, the seedlings after reaching a diameter of around 15 mm quite quickly, start producing stoloniferous offsets.

"It is not a difficult plant to grow on its own roots - it dislikes drying out in the winter and appreciates a fairly rich compost that drains freely - i.e. a typical leaf-mould/grit compost on the acid side. It is also a slow grower on its own roots.

"In my opinion it is a much easier plant than its close relative *Notocactus tenuicylindricus*. This is a much larger plant with long thin spines, some hooked, and a cylindrical habit. It does not produce offsets by stolons alone but also forms offsets on the main stem. *N. tenuicylindricus* seems to need a higher winter temperature than most *Notocactus* to be kept happy. It often loses its roots, inevitably if it goes dry, and develops ugly yellow or brown cancerous blotches at the slightest provocation. A plant that at least for me must be grafted, otherwise it is always in need of surgery.

"*Notocactus rechensis* should also be added to the list of root stolon forming plants listed by Dirk van Vliet, from this area of Brazil."

..... from K. Halstead.

"I, too, like van Vliet was puzzled as to how this plant came to be so named, as since I had first received it in 1967 up until this year it had remained single despite reaching a height of 12 cm. I must admit an offset appeared from near the top of the plant last year but I treated this as an adventitious shoot such as sometimes occurs on *N. scopa*. This year, however, the plant has begun to explain its title as six offsets arose on underground stolons from the main stem. At this rate it



might achieve the 40 heads suggested by Spegazzini.

"Whilst on the subject of underground stolons, I have seen this feature on the following species in my collection: *Notocactus ottonis*, *linkii*, *megapotamicus*, *muricatus*, *arechavaletai* and *acutangularis* (HU 180). All of these are in the Section One discussed by the *Notocactus* study group, or 'Ottones' = *Paucispina* Fric & Kr.

"I find *N. caespitosus* quite free flowering, having produced 13 blooms this year, most of them being out at the same time to give the plant the effect of wearing a glorious yellow 'Red Indian' head-dress. Last year there were only seven flowers, the previous year eleven and the year before that (the first time it flowered) ten. The flowers are pale yellow and the petals are long, slender and pointed and not tightly overlapping as in most other *Notocacti*. They stand out individually as in *N. mueller-melchersii*. The petals are about 40 mm long and 4 mm broad at their widest point and there is a very slight red midrib towards the top of each outer perianth. When fully open the flower measures 50 mm across and the stigma is reddish mauve with the individual lobes remaining tightly clasped together until the flower is nearly over (so different from *N. tenuicylindricus*). The body which is now 13 cm (5 ins) high and 35 mm (1¼ ins) diameter is a darkish slightly blue green and the ribs (15) run vertical except towards the base and on the young offsets where they tend to spiral. The areoles give the appearance of a neat line of stitching with a small amount of wool about 2 mm diameter and not varying very much in size down the body. Each areole has about 14 thin, stiff white radial spines all equal in length - c. 3 mm - and evenly spaced around the areole. There are three red centrals, the lowermost almost always hooked and slightly the longest (c. 5mm). The areoles are situated on the tips of raised humps resembling flattened tubercles on the ribs.

"I have been rather surprised at the lack of *N. caespitosus* in collections in the south although I believe it is more common in the north. However in view of my experience with this species, I am not surprised that it is comparatively rare compared with the other *Notocacti*.

"In commenting on an article on this species in Chileans No.15 I referred to my four plants belonging to this complex. The *N. caespitosus* from the Chileans source failed to root when grafted, the *N. minimus* ex Uhlig is described above, and the *N. minimus* - grafted - from Uebelmann was decapitated and also failed to root. Two offsets from the decapitated scions have rooted since but took twelve months to do so, as did the *minimus* from Uhlig. I managed to graft two further offsets but these are growing very slowly. Two other collectors have told me of the reluctance of their plants to re-root, either as an imported plant or as an offset - which seems to indicate that *N. caespitosus* is somewhat difficult to re-establish on its own roots. Even established, it seems to take some time to settle down and grow but once it is away it seems to make up for lost time.

"The fourth plant to which I referred in my comments in Chileans No.15 was *N. tenuicylindricus* - perhaps better known to some as HU 34. This had rather a chequered career and managed to reach a height of 70 mm and produce two flowers. It developed rot and was temporarily saved by surgery but eventually succumbed as did many other similar specimens from the same source in 1967. *N. tenuicylindricus* is probably a variety of *N. caespitosus* and seems to be almost non-existent in collections. I find it is also a difficult plant to keep and I suspect that it is rather tender and care should be taken with the watering.

"My surviving specimen was from seed sown in 1967. The body which is now 9 cm high and 3 cm diameter is grass green (cf. the blue-green of *N. caespitosus*). It has developed 5 offsets from underground stolons, the largest being nearly the same size as the main stem. Although the stitching of the areoles is similar, the spine formation is quite different, giving the impression that this is a quite separate species. The radials are not so strong and appear more bristle like. Again there are 14 spines all white, but not so evenly placed as on *N. caespitosus*. Four spines are situated close together on each side in a horizontal position. There are three red centrals about 4-5 mm long but never hooked or bent. In the earlier stages there are only two, one up and one down, but as the plant matures so a further one develops upwards. The flowers are shorter (3 cm) than *N. caespitosus* and there are three layers of petals well overlapping as in *ottonis*. The stigma lobes open wide from the time the flower first opens - these are a pale watery red compared with the mauve of *caespitosus*.

"Both species have a prostrate tendency to the stem as it becomes more columnar and both are self-sterile as regards fruit and another plant is required to fertilise the flower and produce seed. I cannot comment on the seed form at this stage but I have cross pollinated the two plants in the hope of producing some seed which must inevitably be hybrid unless these two species are at the extreme ranges of *N. caespitosus*."

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We lack a slide of this species in the slide library - A.W.C.

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*Notocactus tenuicylindricus* Ritter spec. nova.

Columnaris, solitarius, 2-3 cm crassus, 4-8 cm altus, viride vel glaucinus; costis 13-21, 3-4 mm altis, crenatis, interdum dissolutis in tubercula; areolis in summis tuberculis, 1-1½ mm diam., lana alba instructis, 1½-3 mm inter se distantibus; spinis rectis, nitidis, acicularibus; radialibus 10-15, pallide flavis, 3-4 mm longis, centralibus 2-4, fuscis, 3-6 mm longis; floribus 42 mm longis; ovario globosa, lana alba fere obrecto, saetis flavis instructo; sulco nectarifero pallide flavo; tubo florali infundibuliformi, 15 mm longo, citrino, externe lana et saetis brunneis obrecto; filamentis citrinis; antheris pallide flavis; stylo pallide flavo, stigmatibus carmineis; petalis 28 mm longis, 5 mm latis, clare citrinis; seminibus pileiformibus, atris, tenuissime tuberculatis, 1¼ mm diam., hilo basali amplificato. Habitat: Alegrete, ad meridem versus. FR 1361

- Succulenta 49.7.70

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Comments from H. Middleditch

"From this Latin diagnosis it will be seen that the central spines are not hooked and that the stigma is carmine red, thus matching the comments and observations made above."

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#### THE GENUS LOBIVIA - A SEED STUDY By J. Hopkins

To date, Lobivias have not enjoyed much attention in these pages and indeed are not well represented in most collections. The collecting trips of Rausch, Lau and others have made plants and seeds of some species more generally available in recent years. At the same time a flood of new names has appeared in the literature, along with many plants having only a collector's number. Many of these new plants have yet to be described and probably some of these will be varieties of plants already known. To add to the confusion, some of the collector's numbers have been mixed up with the result that one number could refer to two or three different species.

These problems can be tackled by attempting to classify the many species of Lobivia into groups with closely related characteristics. The range of body form, spination, flower, fruit and seed characteristics and geographical distribution should all contribute to the classification of these plants and this may also help to promote interest in this genus.

In Volume III of his "Die Cactaceae", Backeberg put forward a classification for Lobivia based primarily on body and flower characteristics, which would appear to have received little discussion; indeed, there would not appear to be a generally accepted classification for this genus at present. By using the above mentioned characters, it should be possible to determine the relationships between various species in the genus more thoroughly than appears to have been done before. This might bring to light some plants showing features of more than one group, in which case it might not be possible to divide the genus into clearly delineated groups to cover all species, despite the obvious relationships between some of those species. On the other hand,

it may help to decide where plants with no immediately obvious relationships fit into the scheme of things. Especially could it be of value in giving a probable name to an unidentified plant.

Considering the vast extent of the territory in which these plants are to be found growing - some 1500 miles of the Andean mountain chain - it is hardly surprising that appreciable variation is to be found among the plants we know as *Lobivia*. The main link between them all is the flower, one with two sets of stamens, the lower set inserted in the flower tube, the upper inserted at the base of the perianth and forming a hymen. Other genera also display this flower form, but *Lobivias* are further characterised by having a more or less hairy - and a relatively short - flower tube.

In view of the previous success in classifying plants by their seed, notably with *Gymnocalcium*, an investigation has been started into the characteristics of *Lobivia* seed, to examine whether this feature may help in classifying *Lobivia* species into groups. Some difficulties arose immediately, notably the remarkably few sources of seed and the poor range of selection. So far, about a hundred samples of seed have been examined under the microscope, but only a few species were represented by samples from different sources. At the Chileans 1972 weekend it was demonstrated that some degree of success had been achieved in sorting seed into groups, although many problems continue to arise. There have been the usual crop of troubles with wrongly named seed; there are also some seed samples on hand which do not appear to fall within any of the proposed groups. This sort of thing always happens when making studies of seeds.

As far as is known, no published data is available concerning the seed of the *Lobivia*, but one or two comments have been made in literature. As an example, the seed of *L. zecheri* is said to be barrel-shaped and like no other *Lobivia* seed. Thus it is possible that in the past someone has examined some *Lobivia* seed but has not published the results.

On the basis of the species of seed examined so far, the results appear promising, for several reasonably well defined groups have become evident. The characteristics of each apparent group are described below. These descriptions may well need to be modified as and when more sample seeds have been examined, especially since some species have been classified solely on the basis of a single sample of seed. The accompanying sketches depict a typical seed from each of the groups described below. At this rather early juncture, the seed groups have been identified by a number only, rather than by an invented name.

#### Group 1.

The seeds in this group have a dull, black, rough looking testa with little evidence of cell formation. A thin light brown or reddish brown arillus overlays the testa. The hilum is circular to slightly elongated, thick margined and depressed - usually quite deeply, creamy in colour, sometimes with a reddish tinge. Taking the hilum as the base of the seed, the seed is 1.0 - 1.4 mm high, 0.9 - 1.4 mm wide and 0.7 - 1.0 mm thick. The diameter of the hilum is rather less than half of the width of the seed. A ridge extends from near the hilum to part way over the top of the seed.

Distribution: Northern Argentina - Southern Bolivia

Species falling within this group:-

*L. densispina* & vars.

*L. amblayensis* R 19

*L. cylindrica*

*L. driijveriana*

*L. elongata*

*L. graulichii* R 513

*L. haematantha*

*L. kuenrichii* v. R 238

*L. rebutioides* & vars.

*L. saltensis* R 177

*L. sp. nov.* Lau 459

*L. cintuensis* & var.

## Group 2

These seeds possess a dull to moderately shiny black testa broken into a hexagonal cellular structure or otherwise shallowly pitted, the pits defining the corners of the cells. The hilum is displaced to one side of the seed, small and much elongated, more or less level, grey or creamy in colour. Seed 0.8 - 1.3 mm high, 1.2 - 1.8 mm wide and 0.5 - 0.9 mm thick. The hilum is 0.4 - 0.7 mm long, roughly one third of the width of the seed. A prominent dorsal ridge is present.

Distribution: Central Peru southward to Southern Bolivia.

### Species falling within this group:-

<i>L. pentlandii</i> R 201	<i>L. brunneo-rosea</i>
<i>L. culpinensis</i> R 83	<i>L. johnsoniana</i>
<i>L. mistiensis</i>	<i>L. lauramarca</i> R 424
<i>L. multicolor</i> R 422	<i>L. maximiliana</i> R 202, Lau 254
<i>L. wegheiana</i>	<i>L. corbula</i>
<i>L. higginsiana</i>	<i>L. miniatiflora</i> R 452
<i>L. caespitosa</i>	<i>L. incuiensis</i> R 443
<i>L. boliviensis</i>	<i>L. tegeleriana</i> R 394 - 5
<i>L. pampana</i> R 446	<i>L. oyonica</i> n.n R 387
<i>L. argentea</i>	<i>L. churinensis</i>
<i>L. varians</i>	<i>L. Lau</i> 154a
<i>L. minuta</i>	<i>L. Lau</i> 973
<i>L. vilcabambae</i> Lau 146	<i>L. Lau</i> 1002
<i>L. leucorhodon</i>	<i>L. Lau</i> 252

## Group 3

A rather similar seed to the preceding in general shape. The testa is black to slightly brownish (this latter due to being unripe perhaps?) and exhibits a cellular structure. There is usually a light grey arillus layer over the testa but this seems to be very fragile on some seeds and is easily rubbed off. The hilum is rather different to that of the preceding group, being wider and less elongated, i.e. more elliptical in shape. It is creamy or greyish in colour, level and slightly depressed. Seeds 0.8 - 1.3 mm high, 1.2 - 1.7 mm wide and 0.6 - 1.0 mm thick. The dorsal ridge is present but less prominent than in Group 2.

Distribution: N. Argentina & S. Bolivia

### Species in this group:-

<i>L. rubescens</i>	<i>L. potosina</i> R 74
<i>L. muhriae</i>	<i>L. polaskiana</i>
<i>L. jajoiana</i> R 33	<i>L. tenuispina</i>
<i>L. haageana</i>	<i>L. sanguiniflora</i>
<i>L. longispina</i> R 331, R 172	<i>L. Lau</i> 527
<i>L. chrysantha</i>	

#### Group 4

A somewhat larger seed than in the above groups. The testa is dull, black and very rough in appearance, with very little or no evidence of a regular cellular structure. A brown or light brown arillus overlays the testa. The hilum is about half the width of the seed and circular to slightly oval in shape, depressed and creamy or grey in colour. The seed is 1.2 - 1.6 mm high, 1.2 to 1.6 mm wide, and 0.7 - 1.1 mm thick. A dorsal ridge is present but is not very prominent on many of the species.

Distribution: S.E. Peru

#### Species in this group:-

L. allegraiana Lau 149	L. hertrichiana
L. sicuaniensis R 426	L. planiceps
L. incaica R 414, R 421	L. Lau 134
L. lauii Lau 138	

#### Group 5

A similar sized seed to that of the preceding group. The testa is dull to slightly shiny, black, strongly cellular, more or less tuberculate. There is no aril. The hilum is large, circular to oval, more or less thickened at the margin, slightly to quite deeply depressed and creamy or greyish white in colour. It is at least half the width of the seed and usually much wider. The seed is 1.1 - 1.6 mm high and wide, 0.8 - 1.1 mm thick, usually with a prominent dorsal ridge.

Distribution: Central Bolivia

#### Species in this group:-

L. cinnabarina R 62	L. rossii
L. prestoana Lau 388	L. claeysiana
L. pseudocinnabarina	L. backebergii
L. yamparaezii	L. arachnacantha R 180, R 184
L. mizquensis R 463	

In addition to the species listed above, seeds of *L. andalgalensis*, *larae*, *schieliana*, *schreiteri*, *wrightiana*, *hualfinensis* and *acanthoplegma* were examined, but did not appear to fall in with any of these groups. From amongst these species, the seeds of *L. acanthoplegma*, *taratensis* and *larae* are similar, whilst that of *L. wrightiana* is a large and very distinct seed, rather like those in Group 3 in shape but with a rough testa. *L. schieliana* comes close to those in Group 3 but is consistently like the extreme variation in shape found in this group. *L. schreiteri* and *L. hualfinensis* are of a similar form but differ appreciably in size. *L. andalgalensis* belongs to *Helianthocereus* as confirmed by checking seeds of *H. huascha*, *poco*, etc. The flower form i.e. broad funnel shape and very hairy, also supports this relationship.

It is possible to see a considerable variation in the testa in some samples of seed e.g. both dull and shiny examples, also cellular or pitted. It seems that the cellular structure is formed by the regular pitting of the surface; transitions can be seen in some samples between the two states and indeed on some individual seeds it is not uncommon to see cells around the hilum extending part way up the seed where they become indistinct and the testa surface then simply looks pitted. This may be due to a slow drying out process so that the seed testa may start off being slightly pitted and relatively shiny, ending up by becoming dull and cellular. However, this variation seems to crop up fairly regularly over a fairly wide range of samples, so that it may not necessarily be connected with the ripeness of the seed.

Some seeds are extremely wrinkled and yet they look reasonably fresh and this could be due to harvesting before they are completely ripe; in this case the incompletely hardened testa will be more prone to drying out.

All the seeds listed above had a black testa with the exception of two samples of *L. andalgalensis* and *L. jajoiana*. The former were distinctly dark brown and the latter brownish-black. This might be due to those of *jajoiana* being unripe, but probably not with the *andalgalensis* whose colour was the same as *H. poco*. All the seeds also have the ridge or keel present on the testa to a greater or lesser degree.

It will be seen that the dimensions given for the seeds cover about a 50% variation in size. This range of size is often found in a single sample of seed. It is not clear whether this is due to the fruit splitting before all the seed is ripe so that some seeds are smaller than others, or whether such variation is normal and perhaps depends upon the position of the seed in the fruit. If the seed is unripe, one would expect it to become shrivelled from loss of internal moisture through the incompletely hardened testa.

There is also a degree of variation in the shape of the seeds - largely in group 2 and to a lesser extent in group 3. This variation arises largely from differences in the cut-off angle of the hilum. Variations between the extreme shapes are often met with in one seed sample; this may be due to the position of the seed in the fruit. However, some samples seem to be remarkably consistent in shape. An examination of seeds from a whole fruit might be of help here.

Another feature which could also be associated with the fruit is the presence of the arillus layer. In group 3, for example, only in one or two cases was an arillus layer observed as remnants only. Might this be due to the arillus layer being very thin and easily rubbed off? In group 4, very little of the arillus layer remains to be seen on *L. haageana* and *L. jajoiana*, but more can be seen on *L. rubescens* and others. Once again, fresh ripe fruits will answer this question. It will also be of interest to see which fruits have the seed embedded in pulp (perhaps the shiny seeds with no arillus layer?) and which fruits are dry (perhaps the dull seeds with an arillus layer?).

To further this study, anything in the way of seed - or even better still, a ripe fruit - will be of tremendous value. It is of no consequence if the seed is hybrid as it will still bear the characteristics appropriate to the plant which bore it. All that is needed is the plant name and any information regarding the source of the plant.

As observed above, there are many species of *Lobivia* of which neither plants nor seed have been collected recently. This makes any assessment of seed groups decidedly tentative at this stage, but more material would help to produce a clearer picture.

Some of the problems encountered to date might have been accounted for by incorrectly named seed. However, several doubtful specimens have indeed been discarded and a large proportion of the seed used for this study to date has been collected in habitat by Lau or Rausch or is from plants collected by them. Thus it is to be hoped that most of it will have been correctly named. If this is so, then the present conclusions would suggest that there is a geographical overlap in the distribution areas of these seed groups.

A start has been made on comparing this seed grouping with the body habit, flower features, and geographical distribution of the plants. With this widening of the study it is hoped that the divisions become clearer although it is possible that some of the provisional outline ideas outlined above may have to be altered.

Comments on the *Lobivia* seed study.

..... from H. Middleditch.

"I must admit that the great majority of *Lobivias* which I see are a bit of a mystery to me when it comes to naming them. As a result, an article about this or that species of *Lobivia* unfortunately conveys little to me as I can seldom envisage the particular plant concerned. Distinguishing the

fairly closely-packed adpressed radial spined sorts from the sharp ribs and wide-pitched areoles of *L. pentlandii* or *binghamiana* is about my limit. I would like to have some sort of classification incorporating body habit so that when I saw a *Lobivia* I could at least place it into a group containing - say - a dozen or so species names, thus making identification a practical proposition from my point of view. Backeberg's classification of *Lobivias* at least gave me some hope that I might be able to do this, but the comments on species affinities made by Rausch and reproduced in the descriptions of his collecting trips within our pages, were found to be at variance in many instances with Backeberg's system of classification.

"Whilst I look forward to the further results of John Hopkins' examination of *Lobivia* seeds and their correlation with flower and body features, I find the description of the problems encountered already during this process, quite fascinating. We are often presented by an author with a cut-and-dried thesis embodying conclusions on some subject, which is very valuable for reference but may not necessarily make for very appetising reading. Personally I find that the sorting out process and the problems with elusive explanations tend to be more interesting - and there are plenty of problems posed by this article. It is not as if they were abstract matters, for any of these observations can be checked out by any of our readers with nothing more complicated than a simple hand lens and a potter round one's collection.

"During our weekend gathering at Brooksby, there was a fine opportunity to browse amongst the numerous *Lobivia* plants brought by many members present. It was surprising with what relative ease many plants could be grouped together by the similarity of the appearance of the body and spination; however, a quick reference to the species listed under the headings of the seed groups suggested some lack of compatibility between these and the plants grouped together on the table. There was also a selection of seeds available for viewing under the microscope immediately adjacent and an opportunity to relate any plant or group to a growing area from the fairly large scale map of Bolivia hung on the wall - a map which came from one of our German readers. On the occasion of our next weekend gathering I might have an opportunity to spend a little more time looking at such a valuable accumulation of material.

"The use of the word hymen to describe the attachment of the upper ring of stamens to the flower tube does not seem to me to be quite correct. A hymen would appear to me to be, by definition, a membrane and there does not appear to be any separate membrane in the upper part of the tube, either in the form of a fused ring of stamen bases (as on the primary stamens of *Micranthocereus* and *Arrojadoa*) or in the form of an inner wall on the flower tube. I suspect that the uppermost ring of stamens is inserted in a manner no different to any other stamen insertion. On top of that, I suspect that this feature of a ring of stamens at the very top of the tube is not common to all the *Lobivia*; but that on the contrary, it does appear also in some species of *Trichocereus* and other genera. In fact, one seems to come back to the awkward question of what really does distinguish a *Lobivia* anyway?

"Anyone having a *Lobivia* in flower next season who feels inclined to section, photograph and press a flower might help towards an answer to this - and many other - questions, which could contribute to the discussion on *Lobivia* at our next weekend gathering."

..... response from J. Hopkins

"From the brief appreciation of *Lobivia binghamiana* given above by H. Middleditch, I wonder whether he had a correctly named plant in mind when making the comparison? Further to the comments on the "hymen", I would agree that the definition is a membrane and a short cylindrical membrane is indeed clearly visible on some *Lobivia* species e.g. *jajoiana*, in which the bases of the upper stamens are fused together. This feature is probably not present in all species, or it may be much reduced - I have not examined my flowers closely enough as yet, to be sure. The upper ring of stamens is to the best of my knowledge present in all *Lobivias* and also in *Soehrensia*, *Helianthocereus*, and *Trichocereus*. I am not too sure of *Echinopsis* and *Pseudolobivia*."

..... from J.D. Donald

"John Hopkins is to be congratulated on his incursion into the very tangled web of *Lobivia* classification. Is this an implication that no successful classification has emerged to date? This begs the question as to what is meant by successful - after all are the classifications of *Rebutias*, or *Parodias*, or *Neoporterias*, or *Gymnocalycium* successful? I doubt it personally, but nevertheless they are probably better than nothing and hence I welcome this essay by John Hopkins. Certainly there are amongst his tentative groupings some satisfying relationships from a geographical and also morphological viewpoint (flowers and body) but there are also a few uncomfortable bed-fellows. In the long run I wonder whether Backeberg's purely morphological classification might not appear equally successful, but I suspect that John Hopkins' interest is probably deeper than just a search for a better classification and hence I would encourage him to look further and deeper.

"One might criticise him at the start and ask - what is a *Lobivia*? Nowhere do I find this question posed or answered. Might it not be pertinent to include *Echinopsis*, *Pseudolobivia*, *Acanthocalycium*, *Weingartia*, *Sulcorebutia* and *Mediolobivia* also in the same study? This is prompted by the known linking of *Weingartia/Sulcorebutia* to his group 5 not only by seed but also by floral morphology. Similarly if *L. cylindrica* and *L. elongata* belong to group 1, perhaps also does *Echinopsis aurea* because to my belief, the two former are part of the latter complex?

"The geographical distribution just as in the case of the *Parodia* and *Gymnocalycium* seed studies appears to give as close relationships into the groups as do the seed studies, certainly one would expect this. Thus the bulk of Group 2 are plants from the Peruvian/Bolivian area centred on Lake Titicaca, eastwards to La Paz, with extensions northwards further into Peru. I note with interest the inclusion of *Acantholobivia* in the group *L. tegeleriana*, *L. incuiensis* and *L. oyoica* which occur in Peru, isolated to the north of the geographical area associated with group 2. Perhaps Lau 146 (not *vilcabambae* by the way) is a link and also Lau 141, between these groups. Lau 141 is very interesting indeed; it is obviously a form of *L. westii* but differs in one remarkable respect from the plants distributed by the I.S.I., which were propagated from clonal type material. The long tubed orange flowers bear spiny areoles, as do the fruits, whereas the type does not. Like the type, it is a thin branching columnar *Lobivia*, not like the squat *Acantholobivias*. Two other relatives from the Andahuaylas area are Lau 206 and 210, squatter forms of *L. westii*, perhaps with red and orange flowers respectively.

"John Hopkins places Lau 459 species from Portrero in his group 1; this is again very interesting as from all other respects (body morphology and flower) I would have thought of it as related to *L. jajoiana* in group 3, although Lau 459 has a startling glossy white throat and hymen in contrast to the deep purple black of the *L. jajoiana*.

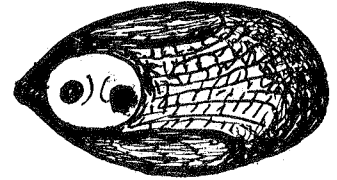
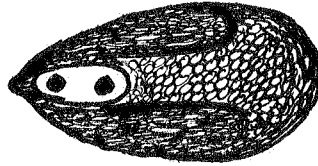
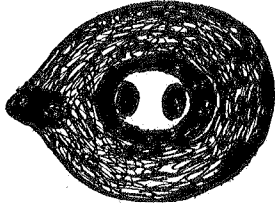
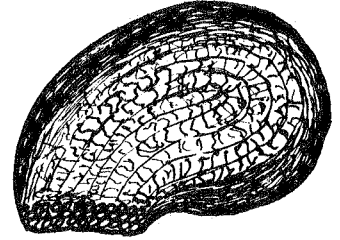
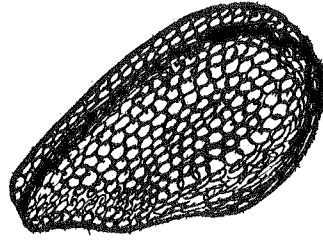
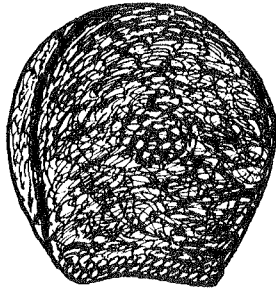
"*Lobivia potosina* R 74 seems to be uncomfortable in Group 3 unless it is found close to the Argentine border. I wonder if the *Knize Pyrrhocactus tupizensis* and kindred species are perhaps also *Lobivias* related to *L. potosina*? Certainly they are not *Pyrrhocactus* nor *Parodia*.

"Group 5 also contains some puzzles by including *L. backebergii* and *L. claeysiana*. From other points of morphology, these two would be expected to belong to the large Group 2 which would also be geographically perfectly acceptable. In Group 5 we would also expect to find *L. oligotricha* & *L. acanthoplegma* and *L. torrecilasensis*. *L. zudanensis* is only a form of *L. cinnabarina* as is *L. prestoana*; *L. rossii* and *L. waterspielii* are only varieties of *L. cinnabarina*.

"As John Hopkins says, there is a very long way to go, the surface of the problem has barely been scratched.

"Seed relationships are not easy and by no means obvious. The external appearance is but one factor, the embryo and its attendant organs cannot be neglected in any seed study. I would recommend a very serious study of Buxbaum's *Morphology of the cactus seed*, published by Abbey Garden Press. In fact, the whole of the cactus morphology series should be read so as to couple floral, stem, fruit and seed morphology into one unified study. Then a really successful classification could result."

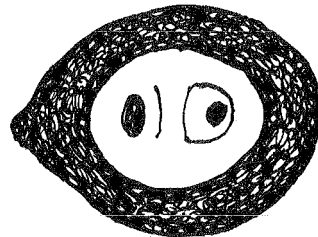
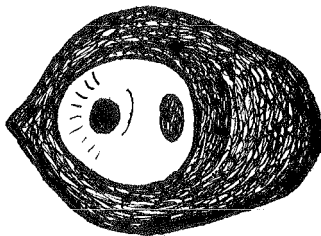
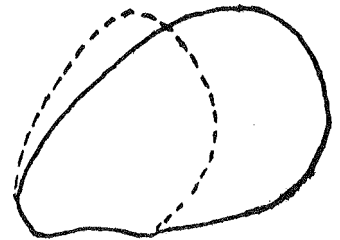
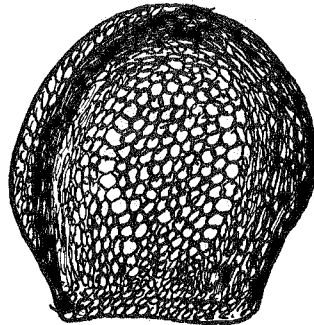
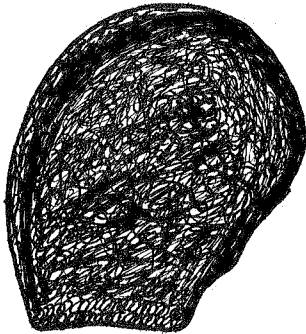




*L. densispina*

*L. pentlandii*

*L. rubescens*



*L. allegraiana*

*L. cinnabarina*

Group 2  
Variation in  
shape

..... from R.E. Hollingsbee

"I have been busy drawing up a habitat map for *Lobivia* species - I borrowed a Times Atlas from the Public Library and by tracings and plotting place names from various other sources drew up a useful but far from complete map. In far too many cases I am unable to plot species location. However, the map is complete enough for its purpose - to assess Markus' and Backeberg's groupings.

"It seems that the 15 groupings of Backeberg leave a lot to be desired. There is, for instance, the case of *Lobivia wrightiana*. This appears to be one of the most northerly species and yet it is linked with species way south in Bolivia (*backebergii*) and even further south in Argentina (*iridescens*, *rubescens*, *marsoneri*). This is hard to swallow. Can such widely separated species be linked in this way? There may be something to be said for linking up Backeberg's *pentlandii* and *mistiensis* groups. And *L. andalgalensis* seems quite out of place in the *Boliviensis* group. In the *Haageanae* group, *cylindrica* and *elongata* appear to be out on a limb, being two of the southernmost species. The *pseudocachensis* group is made up of rather dwarf species and most seem to grow in roughly the same distribution area, except *arachnacantha* which is out on a limb again. Perhaps *pugionacantha* could be linked with its near neighbours *claeysiana* and *kupperiana* in the following *breviflora* group - composition of which seems logical geographically. Possibly *caineana* could be included here also. *Densispina*, *chlorogona* and *rebutioides* - also *scoparia* - are obviously very closely related and form the *densispina* group. Perhaps the *jajoiana* group could be added to the *Haageanae*.

"In connection with Markus' groupings, it is not clear to me whether Markus is saying that *L. leucomella* is a variety of *L. aurea* or closely related, like *L. fallax* and *L. shaferi*. Under the Backeberg classification, *L. shaferi* is one of three or four species in a group called *Shaferae*. This grouping - of *shaferi*, *cylindrica*, *lateritia* and the mystery species *saltensis* has troubled me for some time. All the plants of *shaferi* I have seen (some supposedly imported specimens) are very like *Echinopsis* in form. A flower I have not seen. I have flowered a plant which is supposedly *L. cylindrica* and this has quite a long flower tube and is similar to the flower of *Pseudolobivia aurea* - as is that of *leucomella*.

"But in all this we are handicapped by knowing only the type habitat of many species and not their actual distribution which could throw a different light on things.

"The idea of getting together a collection of *Lobivia* seed for study purposes is fine .... but where does one get the seed? In normal circumstances all *Lobivias* (except *Acantholobivias*) seem to be self-sterile, I am very suspicious of European seed since I doubt whether precautions have been taken to prevent cross pollination. Indeed I would only buy seed from a nursery prepared to guarantee that the seed was collected in habitat by someone qualified to identify the seed bearing plants."

..... further from H. Middleditch.

"I shall be interested to see how the grouping by body appearance, such as Backberg's classification discussed by R.E. Hollingsbee, compares with the seed groups proposed by J. Hopkins.

"Much of the seed used for the above study was obtained under Lau or Rausch field numbers and was probably either habitat collected seed or else seed from imported plants. It is therefore likely to be pretty reliable."

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GYMNOCALYCIUM MARSONERI by M. Broekhoven.

(Translated from "Cactus" (Belgium) 3.8: 1971 by H. Middleditch).

We are indebted for this fine species to Fric who discovered it in the course of one of his exploring trips in the years leading up to 1930. The original description was not very explicit and merely observed (Index of Kreuzinger in 1934) that it had an appearance very much like *G. knebellii* except that it had 7 radial spines distributed three to each side of the areole and the

seventh downward pointing. In 1957, Y. Ito again took up the study of this plant and concluded as follows with its description:-

"Body solitary, flattened globular, matt grey-green; ribs about 15 divided into tubercles, flattened and more or less rounded; areoles elongated and furnished with brownish-yellow felt; radial spines about 7, 2-3 cm in length; at the base pale brown at first, brownish at the tip and becoming brown with age; flowers funneliform-campanulate, 3-3.5 cm long, 3-3.5 cm diameter, pale yellowish-white. Habitat: Argentina".

It must however be observed that the similarity between *Gymno. marsoneri* and *Gymno. knebellii* is not evident unless one compares mature plants, as the young specimens are somewhat different: *G. marsoneri* has only small tubercles and its epidermis is tinted reddish-brown whilst *G. knebellii* develops distinctly larger tubercles and its epidermis is tinted in brownish-black with numerous very pale speckles. One cannot, therefore, in the case of these two species speak of a comparative likeness unless one is similarly able to consider both of them comparable with *G. schickendantzii*. It is all a matter of opinion where one places them and the view one takes of such criteria of comparison. It is for this reason, for example, that in the "Index" of Kreuzinger one compares *G. marsoneri* to *G. knebellii* whereas Backeberg considers (Kaktus A.B.C. 1935) each species only as varieties of *schickendantzii*, which become *G. schickendantzii* v. *marsoneri* and *G. schickendantzii* v. *knebellii*. In 1959 when he published his "Die Cactaceae" he had changed his mind and raised *G. marsoneri* (Fric) Y. Ito to the status of a species, which he did not take up again however other than in his key for identification. We other amateurs can therefore only conclude once again that the taxonomy of the plant with which we are concerned is uncertain.

Who amongst us is tempted to express the contrary point of view? Are we indeed satisfied that we may trust our senses for judging each according to its appearance and ascertaining that there does in fact exist a certain affinity between *G. marsoneri*, *G. knebellii*, *G. schickendantzii* and likewise *G. michoga*? All have ribs, tubercles, spines and flowers more or less similar and their flowers are situated just about the same place on the plant. When for the majority of the species of the genus *Gymnocalycium*, the flowers appear from the young areoles in the immediate vicinity of the growing point, the four plants referred to above (the same for that matter with some others that Backeberg placed in the group *Schickendantziana*: *G. joosensianum* - *anisitsii* - *damsii* - *mihanovitchii* - etc.) have their flowers very much further away from the growing point. The young buds arise similarly at the young areoles from which they arise in all others but, as their development takes a considerably longer time than in other species, the plants continue to grow up until the flowering areoles are situated almost as far out as the side of the plants by the time at which their flowers finally open out. This explains why, in descriptions, there is often reference to the flowers having a lateral insertion: a statement clearly false when one is familiar with the foregoing.

*Gymno. marsoneri* is a fine decorative species whose slightly brown coloration does not fail to provide an unusual touch of colour in the collection of those who are not particularly interested in the genus *Gymnocalycium*. Moreover, taking into account the fair length of time which their flowers take to reach their full opening, they appear at a time at which flowers are scarce in a collection and at which one has the opportunity to admire them thoroughly. As it happens that they do only flower in the autumn, they are always welcome everywhere.

When grafted on *Trichocereus* species, *Gymno. marsoneri* can fairly rapidly attain a fine size without detracting from its characteristic habit.

Comments on *G. marsoneri*

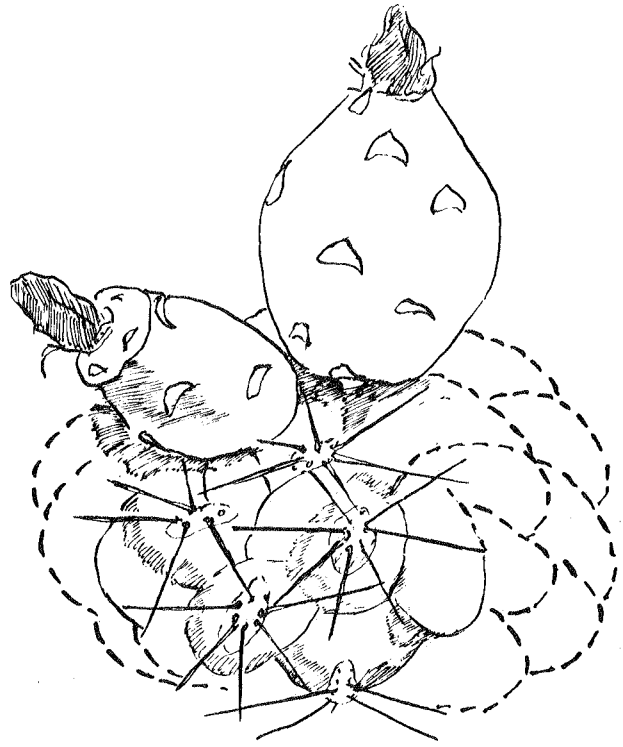
..... from H. Middleditch.

"I am not fortunate enough to possess a plant of this species and so any comment which I make must be second-hand. It is of interest to note that in his article on *G. megatae* (Chileans No. 22) Dr. Schutz does not claim that *G. marsoneri* is synonymous with the *megatae-tudae* complex, thus by inference suggesting that it is distinguishable. Laying side by side the photograph of *G. marsoneri*



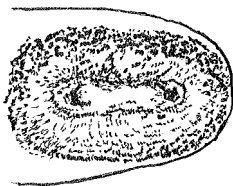
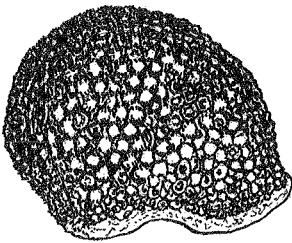
GYMNOCALYCIUM MARSONERI

"Cactus" 3. 8 : 71



GYMNOCALYCIUM "MARSONERI"

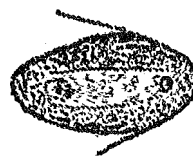
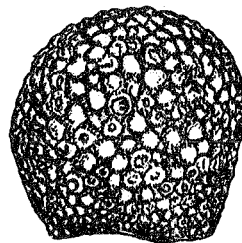
(From an original in the  
G.O.K Slide Library)



Gymnocalycium schickendantzii

SEED

K.u.a.S 22. 4 : 71



Gymnocalycium mihanovichii

SEED

K.u.a.S. 22. 4 : 71

in "Cactus" and *G. megatae* (= *tudae*) in "Kaktusy", one is immediately struck by the somewhat broader and more rounded ribs on *G. marsoneri* and by the cross-groove above each areole on *marsoneri* which is like a letter 'S' when viewed directly. Both illustrations depict areoles sunken slightly into the tubercle, a feature which does not appear to receive a mention in the diagnosis by Y. Ito.

"An examination of my 3½" plant of (presumed) *G. schickendantzii* reveals cross-grooves above each areole which are straight and horizontal, somewhat like the Czech illustration of *megatae*; my plant of *G. knebellii* also has cross-grooves above each areole which are straight and horizontal. For this reason I begin to wonder if the 'S' shaped cross groove on *G. marsoneri* might be a means of distinguishing it from its close relations.

"In his *Kakteen Lexikon*, Backeberg gives the habitat of *G. marsoneri* as Paraguay question mark, while Y. Ito evidently quotes Argentina as the origin of this plant. Presumably this arises due to Fric's well-known propensity for wandering round South America collecting the odd cacti but without any precise record of where each one was found. In view of the amount of habitat collecting which has gone on throughout the cactus country in Bolivia, Argentina and Paraguay in the last few years, it is somewhat surprising that none of the recent importations have shown a resemblance to the plant illustrated in "Cactus". It might be illuminating to ascertain the origin of that particular plant.

"I see from our 1972 Year Book that Rausch records this species as R 159 from the Quebrada de Toro, which is a high valley buried in the Andes behind Salta; presumably that particular find must have occurred from over 3,000 feet altitude. The next question, presumably is "what does R 159 look like?"

"When the *Gymnocalycium* Lau 397 became available with the information that it occurred in the Andean foothills of southern Bolivia, I became very puzzled how a variety of *Gymno. tudae* could be found in upland country when they had previously been found only in the Chaco lowlands. For some reason I had failed to appreciate the spread of the *Muscosemineae* group of *Gymnocalycium*, both in extent and altitude and it was only during a conversation with Geoff Swales that I was induced to refer to the literature. To my surprise I discovered that *G. schickendantzii* came not from the Chaco at all; Schumann refers them to Catamarca and Tucuman and in this classical habitat van Vliet refers to finding plants one metre high. Coming to *G. schickendantzii* v. *delaeitii* (or *G. delaeitii*, as one wishes), Lau found this in the Sierra Medina in Tucuman and Rausch also found it in a high inland valley south of Salta - that is, north of the habitat of *G. schickendantzii*, towards the general direction of the Chaco. Further still to the north one reaches the spot where Rausch collected *G. marsoneri* and over the border in Bolivia there comes Lau 397.

"So now I am left with even more questions. What were those "delaeitii" we saw at Uhlig's in 1964 and where did they originate? Where did the "marsoneri" in the G.O.K. slide library come from? Does Rausch's plant R 159 look like either of these? Or like Lau 397? And do the seeds of these plants fit into the Buxbaum "mihanovichii" group or into the "schickendantzia" group?

"The accompanying sketch by Mrs G. Craig is of a *G. marsoneri* from a slide in the Library of the Austrian Cactus Society. The tubercles are distinct and rounded, the body a matt greyish-green colour. The spines are ginger-brown, giving the impression that they may be almost 1 mm thick at the base, tapering, needle-like, standing slightly away from the body. Of the two fruits shown in the slide, the smaller (and presumably younger) one - on the left - was bluish green with a very waxy coating. The larger (and presumably mature) fruit - on the right - was a bright pinky red colour; not quite as deep a shocking pink as *Islaya* or *Neoporteria* fruits, giving the impression that it was decidedly larger than the pinkish fruits which may be seen on plants of *G. mihanovichii*.

"More recently I have come across a seedling plant of R 159 in the collection of W. Withers; this had quite a bright green body, spines standing well out from the rounded tubercles - which were somewhat flattened in a patch around the areole, which was situated on top of the tubercle. On the sloping shoulder of this flat patch ran a dark purple line in a "U" shape round each tubercle. I was immediately reminded of the "Gymno D 54" which I had seen only a few days previously in the Lavender's collection, with exactly the same marking. On that occasion I

was reminded of the "horse-shoe shaped tubercle" to which Schutz repeatedly refers in his article in Chileans No. 22 - a form of description which had previously conveyed nothing to me tangible. But there, for the first time, I was forcibly struck by this dark purple band in the very horse-shoe shape described by Schutz - and now it had cropped up again, this time on R 159. Not only that, but alongside the R 159 of W. Withers stood a "Gymno sp. 54" just like the "D 54" in the Lavenders' collection. I suspect that both these plants could be B 54, a field number used by Frau Muhr, who resides in El Aguilar. This place, according to my map, is not far from the head of the Quebrada de Toro, in northern Argentina (see accompanying map) which Rausch tells us is the home of R 159. Not only that, but W. Withers also possessed a small seedling of "Gymno tudae HU 316" which had a much darker epidermis than the foregoing plants but also exhibited quite clearly the deep purple coloured horse-shoe shaped line round each areole.

"Are these plants to be called *Gymnocalycium marsoneri*, then? Even though Broekhoven makes no mention of these distinctive markings - indeed, he describes the body as brownish, not light green at all. But could he be referring to an imported plant, rather than to a seedling; will the seedlings lose this distinctive dark band with the passage of time and further growth?"

..... from J.D. Donald.

"In addition to *Gymnocalycium marsoneri* (Fric) Y. Ito, I would also consider *G. megatae* Y. Ito and *G. tudae* Y. Ito, referred to in the previous issue of the Chileans in the article by Dr. Bohumil Schutz from Kaktusy 1966, which was extremely interesting and illuminating. There is little doubt that botanically only one name is sufficient to cover all these large flat growing "Muscosimineum" or "Schickendantziana" plants from Paraguay and Southern Bolivia - also possibly from N. Argentina as well.

"The collections of A. Lau in Bolivia and Argentina, and by A.F.H. Buining with A.M. Friedrich in Paraguay, D.J. van Vliet in Argentina and also by Dorothea Muhr in Argentina, have covered the habitat areas thoroughly and all the old plants have been recollected. Three apparently distinct forms emerge - distinct, that is, horticulturally rather than botanically. All the plants have from 3 - 7 black or yellow spines, arranged one pointing downwards with either one, two, or three opposing pairs pointing sideways. Rarely are there 1 or 9 spines; all are radials - central spines are absent. Spine length varies from 5 mm to up to 30 mm long and all become white with age. Spine disposition and character varies from being tightly adpressed to the plant body to strongly outstanding. Spines can be either curled or straight. The ribs of the plant bodies are either acute or rounded. The three distinct forms are:

1. Rounded ribs and tightly adpressed curled spines.
2. Sharp or slightly rounded ribs with straight or curved spines, all lateral.
3. Very sharp, deep ribs with strongly outstanding straight spines.

All the flowers are white or pale pink and typically schickendantziana. Reference to the original works of Y. Ito and the drawings and photographs of these plants suggest that (1) above is *G. marsoneri*, (2) is *G. tudae* and (3) is *G. megatae*. Backeberg's photograph in the Kakteenlexikon of *G. marsoneri* is not the same as that from Y. Ito - Backeberg's photograph is probably *G. tudae*.

"Buining, in the company of Friedrich, retraced the latter's earlier collecting trips and recollected *G. tudae* and *G. megatae* forms (HU 316 and HU 317) and also found a new habitat for both types near Nueva Asuncion. Type (2) above was confirmed as *G. tudae* and type (3) as *G. megatae*, but admitted that this was only for convenience in the catalogue. There was naturally a whole range of intermediates (this confirms observations by Schutz et alia on the pre-war seedlings). Lau in southern Bolivia collected many plants (see Chileans 21) under the names *G. izozogzii*, *G. chuquisacanum*, etc., that were clearly not Microsemineae or "Pflanziana" but Schickendantziana - large flat bodies with more or less acute ribs and 5 - 7 spines laterally displayed - i.e. *G. tudae* forms; Lau 371, 374, 396 and 944 may be referred here. Lau 397 from Paracari is

different in that the plant body is wholly green at all times and has outstanding spines rather than lateral - perhaps a *G. megatae* in Y. Ito's original sense. Lau 396 differs from 371 and 374 only in length of spine, being rather short - only 5-10 mm long. Lau's recollection of *G. pseudo-malacocarpus* confirms the closeness of this plant to *G. tudae*, as a distinct variety with fewer, broader ribs and thinner spines.

"As Dr. Schutz has said, the plants distributed by K. Uhlig in 1964 as *G. marsoneri* are not this Fric original type but a *G. megatae* form with very sharp ribs and outstanding spines. I agree with him. However, *G. marsoneri* has been recollected by D.J. van Vliet at Campo Quigano and by D. Muhr near the Quebrada del Toro as B.54. Both these plants appear to be nearly identical with Rausch's R 159, apart from the fact that the latter has rather more outstanding spines. All the plants produce pink fruits that vary somewhat in size and shape, from 20 to 35 mm long and from 8 to 16 mm broad, more or less lemon shaped. Lau's 446 from the Sierra Medina - the southernmost locality of these forms - is also probably the same as R 159; it also has the strongly outstanding pale yellow spines.

"Dr. Schutz has suggested that we use the name *G. megatae* but regrettably he did not cite the basionyms and made no formal new combination nor synonymy. Hence we must follow the earliest legitimate consideration of these plants. This is in the National Journal under my article on *Gymnocalyciums* from A. Lau, Parts 1 & 2. Had I been aware earlier of Schutz's choice of *G. megatae*, I would have followed him, but I chose *G. tudae* as the collective name as the type 2 plants had the widest distribution.

"For the moment *G. marsoneri* is best kept as a distinct species until it has been wholly characterised and its distribution better known.

"Is *G. kowalskianum* another plant in this same group that requires further investigation? Or is it *G. asterium*?

"The horseshoe shaped tubercles mentioned in Schutz's article still puzzle me, too. The observations by H. Middleditch of the dark coloured band in the shape of the horseshoe may not be a true diagnostic feature as it is found in a large number of species of both the *Mihanovichiana* and *Schickendantziana*.

"*G. michoga* (Fric) Y. Ito is synonymous with *G. schickendantzii*, as is *G. knebelii*."

..... further from H. Middleditch.

"On receiving the above intimation of van Vliet's finding place of *G. marsoneri*, I repaired to the excellent map of Argentina which came from F. Brandt and was able to find without difficulty "Campo Quijana" situated about 5 Km north west of Rosario de Lerma, at the foot of the Quebrada del Toro. This fits in nicely with Frau Muhr's B 54 discovery place of the Quebrada del Toro. It is also not an enormous distance from Salta township to the Sierra Medina, the location of Lau 446 which John Donald suggests is a form of *marsoneri*. On the basis of this evidence it would appear that this species can be placed in the Andean valleys just off the S.W. Chaco.

"It would seem that the N.W. Chaco plants distributed as *Gymno "izozogzii"* etc., with the slim white flowers coming more from the shoulder of the plant, may be called either *G. megatae* sensu Schutz or *G. tudae* sensu Donald, as one wishes. It would be interesting to hear whether the anthers are grey on any of these plants. Also, what the fruit is like! The fruit as described by John Donald certainly matches the example sketched by Mrs. G. Craig and also matches the plants seen in fruit at Uhlig's nursery some years ago".

..... from C. Walker.

"My seedlings of *G. tudae* HU 316 fit the notes from H. Middleditch - the areoles are raised on tubercles, with a purple "V" shape immediately below each areole. None of the mature, habitat collected plants I have seen of this sp. possess this "V" shape. Perhaps this is a juvenile feature

then, typical of the *Schickendantzii* group."

..... from G.J. Swales.

"I am even now, somewhat diffident in making any statements about the *Muscosemineae*, in spite of 242 different seed samples and many hours of study, but on reading the comments of H. Middleditch and J.D. Donald, I feel I must cast a few spanners into the works if for no other reason than to have these gentlemen cast them out again, with explanations attached !

"The horse-shoe shaped marks on many *Muscosemineae* seedlings are indeed a very noticeable feature and at the Chileans Weekend Gathering I was almost convinced when H. Middleditch lined up some nice examples. However, according to my own seed groupings it would appear that B 54 (4 samples) is very close to *G. schickendantzii* and in addition my own seedling also resembles that species in plant characteristics, while Rausch 159, *G. marsoneri* and *G. tudaе* HU 316 belong to a different group - that around *G. megatae*. Hence it would appear to be of limited use in identification and I would agree with J.D. Donald in this. In addition, I have noted this marking on very young seedlings of other seed groups altogether. If memory serves me aright, *G. gibbosum* shows them on occasion but loses the feature very early indeed.

"I wonder if our kind translators might check their work and see if Dr. Schutz's reference is to horse's "hooves" rather than to "shoes"? The former are three dimensional and thus lend themselves to tubercle shapes rather than "shoes" which are essentially two dimensional. Some of the tubercles in question might be likened to horse's hooves.

"J.D.Donald's statement that *G. marsoneri*, *tudaе*, and *megatae* are members of the *Schickendantziana* (sensu Buxbaum) worries me. I would be inclined to separate them from this group by the body and seed form, which are demonstrably different.

"While my seed observations agree with J.D.Donald's close association of *G. pseudomalacocarpus* with *G. tudaе*, as stated above, I cannot accept "B 54" as part of this group, though Rausch 159 and *G. marsoneri* could well be close.

"Since commenting on Dr.Schutz's article on *G. megatae* in Chileans No. 22 I have examined seed from Uhlig under the names *G. rotundicarpum*, *G. seminudum* and *G. fricianum* and for what these single observations are worth, the first two have seeds very much akin to *G. megatae* while *G. fricianum* was of the *G. mihanovichii* type. However, bitter experience warns me not to rely on single samples !

"Finally, while agreeing that there are distinct similarities between the plants that I have under the names *G. michoga* and *G. schickendantzii*, I am not at all certain that they are synonyms, while all five of my seed samples of *G. knebelii* are nearer to the *G. megatae* group and are not of the character of *G. schickendantzii* at all.

"I will now sit back and await reprisals".

..... further from H. Middleditch.

"A check on my Czech dictionary confirms that the word "podkova" which appeared in Dr.Schutz's article on *G. megatae* does indeed mean horse-shoe. The separate words for horse and hoof would produce quite a different word in Czech, so short of it being an idiomatic phrase it would appear that Schutz really did write horseshoe.

"The two seed types which Buxbaum puts forward as typical of the two sections of the *Muscosemineae* viz: *schickendantzii* and *mihanovichii*, are shown in the accompanying illustration. This is basically in line with the two divisions of Fric and later of Schutz, although a seed rather than a floral criterion is used. I see that G.J. Swales is suggesting the separation of *G. tudaе*, *megatae*, *marsoneri*, Rausch 159, and *knebelii* as a third section under the *Muscosemineae*, on the basis of the difference in the seeds from these two other sections. Having had a look at some of this seed under the microscope myself, I can confirm that the "footprint" shape of the hilum in this



third seed group can be distinguished without too much difficulty and that it is quite distinct from the Schickendantzii and Mihanovichii group seeds."

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AMONG THE ARGENTINIAN CACTI by A.F.H. Buining.

(Translated by E.W. Bentley from K.U.A.S. 20/9/69)

My wife and I flew to Cordoba in mid-November, 1968. Cordoba is a fast-growing town surrounded by numerous mountain chains. On these mountains we collected *Notocactus submammulosus*, *Gymnocalycium multiflorum* as large golden spined balls, *G. mostii*, *capillaense*, *quehlianum* and *Trichocereus candicans*.

In addition, I wanted to search for *Gymnocalycium vatteri*, published by me at that time, at the type-locality near Nono. On the bus we travelled up to about 1800 m to the stopping place at Copina, where we found *Echinopsis aurea*, *Gymnocalycium multiflorum* and *bruchii* and also *Notocactus submammulosus*. Again we travelled by omnibus up to the plateau of Pampa de Achala at 2270 m. Up to this point *Gymnocalycium multiflorum* occurred again and again. On the plateau we could see no cacti from the bus, but on the descent we again saw the golden yellow balls of *Gymnocalycium multiflorum* and nearby, *Acanthocalycium violaceum* in full flower. To Nono at a height of 950 m we had a very beautiful curving drive down.

In Nono we met, quite by accident, a German who collected and prepared insects such as butterflies and beetles. He invited us to join him on a collecting drive on the next morning. We were very early at his beautiful bungalow which stood in a very restricted growing area of *Gymnocalycium vatteri*. Together with this plant there grew *Gymnocalycium prolifer*, *Trichocereus candicans* and infrequent *Acanthocalycium violaceum*. The one square kilometre at the most of growing *Gymnocalycium vatteri* included some very fine specimens. I was able to establish that some 80% of the plants had only the single spine per areole of the type. Without doubt they remain a rarity at the type locality.

We tried afterwards to gather some seeds in order to increase these fine plants. At the same locality we found beautiful clumps of *Gymnocalycium prolifer*. After an excellent lunch in the home 'Los Acacias' of our host we drove in his truck to the easterly mountain cliffs of Pampa de Achala. Immediately we saw here fine flowering pieces of *Opuntia cordobensis*, further up *Opuntia sulphurea* and first, at 1400 m, large specimens of *Acanthocalycium violaceum*.

From Cordoba during a long weekend we drove to the Famatima massif with the Cannata family. On the way to Chilecito we came to the deep red-coloured, almost bare mountain near "Los Colorados". Here grew numerous *Tephrocactus papyracanthus* in full bloom. At the foot of the xerophytic shrubs growing there thinly we found *Echinopsis leucantha*, which otherwise was found by us chiefly in north Cordoba and La Riojas up as far as the province of Salta; also a short-stemmed form of *Echinopsis aurea* and in addition, quite withdrawn into the soil, *Gymnocalycium bodenbenderianum*, *ragonesii* and *ochoteranae*. Also, all over, numerous *Trichocereus candicans*, *strigosus* and *huascha* in various flower colours. But soon came the finest in the form of *Pyrrocactus bulbocalyx*; large heavily-spined specimens showed their yellowish flowers. They grow there only on the completely bare red cliffs. The mountainous landscape is everywhere, here and there, grown over with whole woods of giant *Trichocereus terscheckii*. From this interesting discovery site we drove as far as the foot of the Famatima massif to Nonogasta and quartered ourselves in the interesting old Spanish inn "Posta del Velasco".

In the afternoon we drove to Chilecito and from there through a real desert valley to the village of Famatima. In this valley and also further on in the whole Famatima area grow numbers of the many forms of *Trichocereus huascha*, *strigosus* and *candicans* in all imaginable flower colours. We discovered a rarity there, *Tephrocactus alexanderi*. Further on beyond Famatima, and also, on the next day, more to the west we found the fine large spheres of *Gymnocalycium saglione*. The plant seemed to me, on account of the very fine seeds, to be related to *Gymnocalycium pflanzii*

collected by us in the Gran Chaco. Somewhat to the east of Chilecito by the village of Aguinam we could see long-spined forms of *Gymnocalycium ochoteranai*. It was a pity that time was so short to look for *Lobivia famatimensis* and a *Blossfeldia* sp. above Famatima.

On the next day we drove to Questa de Mirande in the Famatima area. In this southern part of the massif are wonderful deep valleys. At a height of 2000 m we found *Denmoza erythrocephala* in flower. The plants there were up to 60 cm high. At the top between the red, curved spines they are fairly white-haired.

In the evening, on the way back to Cordoba, a bad tornado had preceded us which had torn up all trees and telephone posts and turned what a few hours before were completely dry brooks and narrow valleys into wild torrents. It was impossible to drive further and we had to stop overnight in Chamental. The next morning we drove west of Cruz del Eje through whole forests of *Stetsonia coryne*.

From Cordoba my wife and I were able to get a flight out to Salta. From there we visited the celebrated Quebrada de Toro, where, behind the village El Alisal at a height of 1800 m, a form of *Cleistocactus jujuyensis* occurs, also but sparsely, *Trichocereus pasacana*, the areoles here being without noticeable hair. Above Alfarcito there was a very narrow rocky area, where "pasacanas" grew on the cliffs. All the Indian huts and a hotel there are built from pasacana wood. From 2100 m occurs the very beautiful *Pyrrhocactus umadeava* (umadeave? - E.W.B.), at first only here and there, but soon in whole groups. The higher one goes the whiter become the long curved spines that quite cover the crown of the plant. Between 3500 m and the top of the pass at 4200 m we saw the large spheres of *Soehrensia korethroides* with their red flowers. The plants are fairly flat and then later somewhat elongated. From the top of the pass the road goes over a desert plateau where we met a herd of llamas, to the bleak San Antonio de los Cobres. There however, at the highest point, we found clumps of *Tephrocactus*. On the way back with a view of Nevada Acay (5950 m) and Nevada Chani (6200 m) we could again see *Trichocereus pasacana* occurring at a height of some 3500 m, which had snow-white hair. This thick hairiness of the areoles gradually disappeared on the way down.

The next day a bus took us from Salta to Cachi. The fairly narrow valley at first was packed tight with trees. Then at 1950 m came the first pasacanas. We passed places wellknown in the literature like Escoipe and Cachipampa. Soon the pasacanas disappeared, only to reappear at the top of the pass at 3300 m. On the return drive to Cachi at 3000 m we saw the first *Parodias* - beautiful golden yellow-spined plants that we later found round Cachi. At a height of 2900 m the valley opens into a wide plateau that is covered with unbelievably beautiful white pasacanas. Shortly afterwards we arrived in Cachi, a pretty little town at a height of 1200 m, with large clumps of fine weeping willows along the comparatively dry stream. One encounters these willows very frequently at this level here in North Argentina. Because the omnibus goes infrequently we had to take a taxi. At first it went to La Paya, a little south of Cachi, where we partly climbed the Cerro Bola and found forms of *Echinopsis aurea* and *Parodia maasii*. Along the road from Cachi to Molinos we found *Parodias*, *Lobivias* and *Opuntias*, as also elegant groups of *Tephrocactus weberi*, *Gymnocalycium spagazzinii* and *Acanthocalycium catamarcense*, to name only a few species. De Valles Calchaguies, in which flows the Rio Calchaquis, was almost dry at this time. In the region of La Arcadia-Angastoco-Santo Rosa the mountains are completely bare. As a result of erosion these mountains have taken on the most wonderful forms so that one imagines oneself to be transferred to a strange planet.

The taxi brought us as far as Angastaco; there, the next morning at 5.30 we waited for the bus. With much trouble we found shelter in this lonely, bleak village with an old Indian woman.

In Cafayate we stayed one day and in the mountains there collected among other things a form of *Gymnocalycium saglione* and *Parodia sanagasta*.

From Cafayate on the Tafi del Valle and Tucuman. Towards Tafi del Valle an interesting *Soehrensia* grows near T. pasacana and *Echinopsis leucantha*. At about 2800 to 3000 m from El Molle over the high pass to Infiernillo we found a golden yellow spined *Soehrensia* which was taken by

Backeberg from a photo to be *ingens*. It is interesting to note however that this plant occurs as far as Tafi del Valle at 2000 m and even lower. As I have already said, this plant at 3000 m has golden yellow spines and a diameter of up to 40 cm, perhaps even more. But, when one gets nearer to Tafi del Valle, the spination becomes shorter and also the colour of the spines more brownish so that near Tafi del Valle and some distance beyond this plant resembles our wellknown *Soehrensia bruchii* exactly. Provisionally I might therefore postulate that this so-called *ingens* is only a high mountain form of *Soehrensia bruchii*. Just beyond Tafi del Valle in the Valle de Tafi flows the Rio Angostura and here are famed sub-tropical rain forests where, according to reports, *Chamaecereus silvestrii* should grow on the rocks, but we did not find this plant here. From Tucuman we travelled in a large bus through the Salinas Grandes, where *Stetsonia coryne* grows in the salt region.

From Cordoba we flew to Mendoza where we were picked up by our pen-friend, Dr. Gomez Rueppel. And with him we visited first Challao - a cactus desert zone outside Mendoza. Here a new university town is being built. Between great holes caused by bulldozers we found beautiful flowering *Tephrocactus* and *Echinopsis intricatis-sima*, but also many forms of *Trichocereus candicans*, *huascha* and *strigosus*. Somewhat further away from the area of the university town we found *Denmoza erythrocephala* and *rhodocantha* (if one uncompromisingly wishes to recognise these as two separate species). There grew also *Pyrrhocactus catamarcense* as a transition to the Chilean species of *Pyrrhocactus sensu Ritter*.

The next long sought after plant in the Quebrada del Toro (with the same name as the one at Salta) was *Denmoza*. We drove first in the direction of Uspallata. Fairly soon we found in the mountains the first *Denmoza rhodocantha* and a *Blossfeldia* species in crevices of very steep cliffs. Without doubt it was the most southerly-found plant until now: from there on occurred *Pyrrhocactus catamarcense* regularly. About 20 Km east of Uspallata we found great groups of *Denmoza*, but not as we usually know it - with reddish to red spines - but with yellowish to golden yellow. They were huge plants there, full of ripe berries. It is incomprehensible to me that this form, variety or species has never been mentioned before. In the Quebrada del Toro at the same level all *Denmozas* were again darker and reddish spined. One should not of course put much value on this coloration, but on the other hand it is certainly a form, at any rate, because it occurs there in large groups. Further beyond Uspallata in the direction of Cruz del Paramillos, where the Quebrada del Toro again falls away, we found, high up, large bushes of a *Tephrocactus* species. At the so-called 'balcony' at 3000 m we found the first *Soehrensia formosa* with quite snow-white spines, and near it *Pyrrhocactus catamarcense* again. From about the 1600 m level downwards every place is full of the finest *Soehrensia formosa* in many forms. I could not recognise the varieties *maxima* and *polycephala* set up by Backeberg. There were very big plants and also many that in old age had offsets at the base, or many with damaged heads on which offsets occurred. As so often in the Andes the higher growing forms are much whiter spined than those further down. Both the so-called varieties are, in my view, not even forms. Naturally I took many colour pictures of these fine plants which on the grounds of cost alone cannot be reproduced here.

#### Comments on the Argentinian Cacti

..... from H. Middleditch.

"Much of the above account covers travels in the area shown on the accompanying map and several of the place names mentioned by Buining may be located on this map, other place names in this article may be located on the map in Chileans No. 19, p.193.

"The references to *Soehrensia formosa* make interesting reading when compared with the accompanying article describing this genus. The location given as the "high pass to Infiernillo" is that going from Amaicha del Valle to Tafi del Valle.

"A form of *Parodia maasii* is reported to have been encountered near Cachi, which is a great distance to the south of the location around Tupiza/Tarija in Bolivia which one normally associates with this group of *Parodia*.

"The flash flood described by Buining, produced by a destructive thunderstorm, is typical of the erratic and localised rainfall received in mid-Andean Argentina."

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SOEHRENSIA Backeberg by H. Rubingh.

(Translated from Dodonaeus 1966.1. by Mrs L. Teare).

Among his latest discoveries in South America, Herr. F. Ritter found two Soehrensias: *S. mendoza* and *S. schaeferi*. Herr Ritter has not yet published the description of these two species, but seeds sown by many collectors have already grown into good size plants.

The seedlings grow without difficulty and make fine plants. *S. schaeferi* develops strong red brown spines, not soft as described by Ritter, but stiff and hard, reminiscent of *Denmoza*.

In well-established collections one may now and again come across mature plants labelled *Echinopsis formosa*. They do, in fact, rather look like *Echinopsis* but, unlike them, *Soehrensias* rarely flower with us in northern Europe. On one occasion, I saw one in bloom in an old amateur's collection, at Zwolle; a plant 25 cm high and 20 cm in diameter, standing right against the glass, with beautiful yellow flowers on top of the plant which remain open several days. The flower is funnel shaped like *Helianthocereus*, the flower tube being short, covered with scales and black bristles.

From another old collector I received a twenty year old plant which had never flowered and for which he no longer had any inclination to wait. This would not be a sufficient reason for my having no interest in it.

In his travels in South America, Curt Backeberg also collected other species of similar habit and erected the new genus *Soehrensia* for them. All these plants and their flowers show certain similarities with *Echinopsis* and *Lobivias* and are sometimes known by these names.

*Soehrensia formosa* can reach 2½ m in height and a diameter of 40 cm. The spines vary from glassy white to reddish brown or red. Backeberg mentions two varieties; *maxima* and *polycephala*. Later, Ritter offered seeds for sale of a red flowered variety.

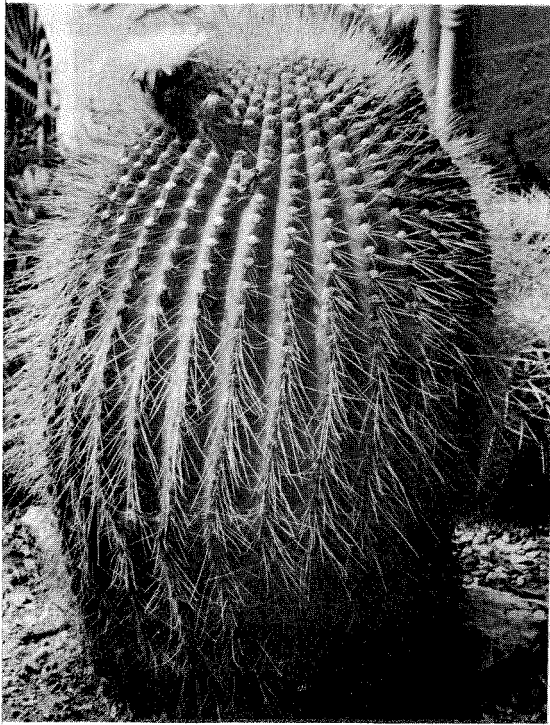
*S. bruchii*, wrongly named by some *Lobivia bruchii*, flowers before reaching a comparable size. At the cactus nursery of M. Jansen in the Hague, I saw a *S. bruchii*, 12 cm in diameter with fine dark red flowers. Plants sown in Europe can never be expected to be so strongly spined as imported plants.

The Czech cactus collector Fric also found at a high altitude a variety *nivalis*, covered with long snowy white hair, which no one has ever rediscovered.

Among a batch of imported plants which I received several years ago, I found a globular plant 15 cm in diameter bearing some similarity to a *Gymnocalycium*, but which could not possibly belong to that genus. My interest was further aroused when soon flower buds appeared, similar to those of *Acanthocalycium* covered with close spiny scales. I was almost convinced that I had a new *Acanthocalycium*. Unfortunately these famous buds did not open because the plant was visibly on the decline. Grafting did not succeed nor did mist propagation. I was lucky in having taken some offsets - these rooted normally and grew well. Meanwhile, in Backeberg I found a paragraph giving a description of *S. oreopepon* (Speg) Bkbg., with sharp scales on the flower tube. This species was named *oreopepon* because natives called this plant the mountain melon, on account of its globular shape and yellow flowers.

My grafted plants are looking more and more like seedlings of *S. de Mendoza* from Ritter's seeds. I wondered whether these two species could be the same, as both come from the Mendoza district of N.W. Argentina it seems quite likely.

It is interesting to note that *S. oreopepon* (Speg) Bkbg. has been described by Spegazzini as a *Lobivia*, by Werdermann as an *Echinopsis*, by Backeberg as an *Acanthocalycium* and lastly as a



**Soehrensia formosa**

COLLECTION - DELRUE

PHOTO - RUBINGH

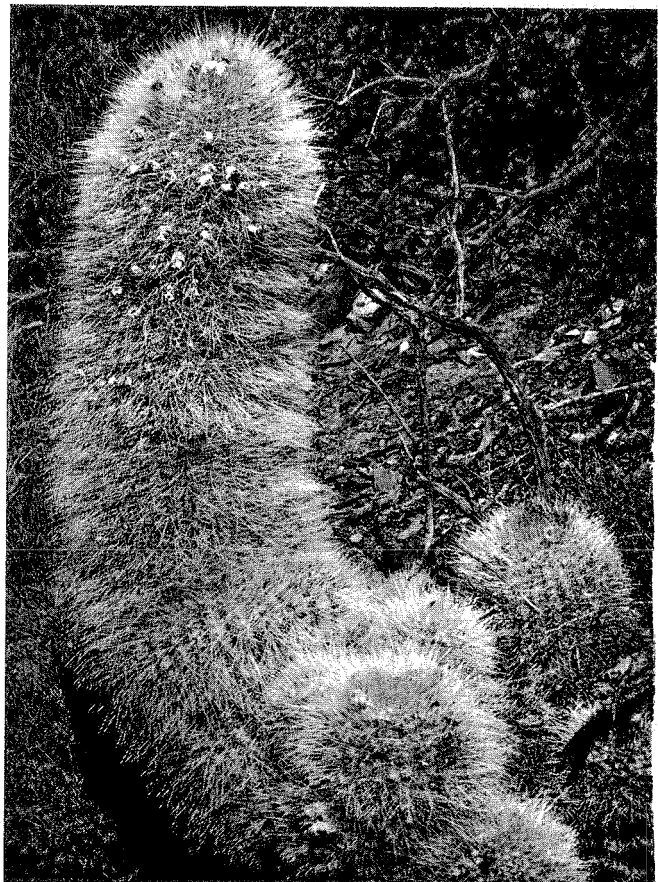
Dodonaeus 4.1:66

**Soehrensia formosa**

QUEBRADA DEL TORO  
MENDOZA ARGENTINA

Photo BUINING

K.u. a. S. 20.9:69



Lobivia by Marshal. Fruits and seeds were unknown to one and all. Without being able to examine the flowers, it is very difficult to identify an unknown plant and I have often had to wait many long years before naming some of my globular and short columnar species. Britton and Rose class them as Lobivias, but this does not seem likely to me. If these plants were Lobivias, they would show some slight analogy with other species of the genus. Krainz named them as Pseudolobivia but it does not seem possible to classify them as such. And when at last *S. oreopepon* does flower, the flowers are very similar to those of *S. formosa*.

There is also *S. grandis* (Br. & R.) Bkbg and *S. ingens* (Br. & R.) Bkbg. This last species seems to be very rare, it has not, to my knowledge, been found again in habitat; furthermore, there is hardly any information on that subject. Britton and Rose say it can reach 1.20 m in height. Backeberg published a photograph by Castellanos showing a large globular plant with numerous ribs which does not seem to be the same as the plant described by Britton and Rose. Like *S. oreopepon*, *S. ingens* and *S. grandis* produce many offsets at the base.

Backeberg also describes *S. smrziana* but he has not seen the flowers. I have sown seeds of this plant and the resulting seedlings are like those of the *Trichocereus* with the white flowers opening at night. These plants make rapid growth and reach 50 cm in five years, at which stage they flower.

No *Soehrensia* has been found east of the Andes, but Lembcke discovered one recently in Chile where it grows to a height of 1½ m and 40 cm diameter. It has strong yellow, brown or red spines. It has been named after the Swiss importer Uebelmann.

Comments on *Soehrensia*.

..... from H. Middleditch.

"A perusal of Backeberg's Lexikon yields the following species of *Soehrensia*: *bruchii*, *formosa*, *grandis*, *ingens*, *korethroides*, *oreopepon*, *uebelmanniana*.

"Under *S. smrziana*, Backeberg observes that 'not till lately did Rubingh see the first sign of flower and from that, this plant is to be treated as a *Trichocereus* species.'"

..... from R. Tyrrell.

"About twenty two years ago I acquired some seed of the plant we now call *Soehrensia bruchii* and from that sowing I kept one plant which is now about 20 cm in diameter. It has flowered for me and set seed for the last five summers. The fruit is almost 2 cm broad and squat, the flower remains are persistent. The fruit splits vertically when still green - I always take the seed out when the pod bursts and dry it by rolling it on newspaper - it always germinates well."

..... from J.D. Donald.

"I have a fair collection of these plants but I have flowered very few. They are certainly the giant of the South American globular cacti. Most of my plants in this genus have been raised from seed, with the exception of *S. formosa*, *S. grandis* and *S. korethroides* all of which are old prewar plants imported as either *Echinopsis* or *Lobivia*. *S. formosa* flowered last year for the first time but has not done so this year; it is indeed a bright golden flower with a scaly tube but also having a few black hairs in the axils. Superficially it resembled an *Acanthocalycium* but lacked the bright red stigma characteristic of the yellow *Acanthocalyciums*. I have also seen this plant in flower at Les Cedres. My personal opinion is that *S. formosa* and *S. oreopepon* are the same plant - mine certainly are though the latter has not flowered.

"The most recent introductions, *S. sp. de Mendoza* FR 7, *S. schaeferi* FR 556, and *S. uebelmanniana* are very similar. FR 7 is perhaps more globular and the others more cylindrical in youth, but otherwise there is little to distinguish them. All possess dark green epidermis with strong orange-red spines up to 40 mm long. If *S. uebelmanniana* truly comes from Chile then it may well be a

separate species from the other two. Both FR 7 and FR 556 seem to be closely related to *Soehrensia formosa*/oreopepon and bearing in mind the strong propensity for natural variations shown by South American cacti, I believe one specific name is all that is necessary to cover all four plants.

"*S. bruchii* is most certainly the easiest to flower and also the fastest grower. Some fifteen years ago I sowed some 'wild' seed of *S. bruchii* and retained four plants showing the most distinct variations. All four have grown well into large globular plants - the biggest is now 30 cm across and has flowered regularly for the last seven years producing rings of fluffy black buds around March which develop into very short tubed scarlet red flowers around mid-May. The other plants are about 20-25 cm across and much more strongly spined and have also flowered regularly if less prolifically - one produces orange flowers with a greenish tube longer than the others - the others produce mid-orange to scarlet flowers, one spatulate in petal form and the other lanceolate. The flowers hybridise very easily with *Trichocereus*, *Echinopsis* and *Lobivia*.

"*S. grandis* has never flowered for me, it is slower growing than most. It offsets more frequently and is less globular than most *Soehrensia* species, the individual heads on my plant are about 8-10 cm thick and up to 20 cm long and semi-prostrate. The photograph in *Die Cactaceae* Vol III on page 1679 is a very good likeness to my plant.

"My plant of *S. korethroides* looks like a longer finer spined form of *S. bruchii*.

"*S. smrziana* is without doubt a *Trichocereus*, young plants superficially resemble *S. grandis* but the *smrziana* plants remain upright and rarely become prostrate. The plant starts to flower for me at about 25 cm high and then produces a typical white *Trichocereus* flower from young areoles near the crown. Pink flowered forms of *smrziana* have been reported but these may well be hybrids.

"There was another *Soehrensia* name - *S. superba* FR 1155; this is actually a *Trichocereus* with thick short stems and beautiful large purple red flowers and described by Prof. Cardenas as *Trichocereus randallii* (*Cact. Succ. J. Amer.* XXXV 1963, p.158). It was transferred by Backeberg to *Helianthocereus*.

"*Soehrensias* are closely related to both *Lobivia* and *Trichocereus* and hence to *Echinopsis*. Under rigorous botanical analysis the characteristics used to differentiate these four genera (and others) do not clearly separate them and suggest that *Echinopsis* may well be the proper home for all these plants, but it will be a brave man who formally undertakes to make such a proposal and produces the necessary comb. novae and synonymy !

..... and John Donald also asks "is the Fric variety *nivalis* merely a high altitude form of *bruchii*?" In the account of his collecting trip in Argentina given in the *K.u.a.S* 20:9, 1969, A.F.H.Buining, referring to *Soehrensia formosa*, states: 'As so often in the Andes, the forms growing at higher altitudes are much whiter spined than those from further down' and in his account in the *N.C. & S.S. Jnl* 24:1, 1969, he speaks of *Soehrensia formosa*: 'the young plants globular with brown spines and without hair in the areoles, later on the spines become shorter and the areoles produce white hairs and white spines, especially in the higher regions.' The account written in German is accompanied by a photograph of a columnar *S. formosa* which at first glance one might have taken for an extra-stout *Cleistocactus strausii*, the spines are so light, fine and close-packed.

"It is not practicable to tell from the photograph if there is hair from the areole in addition to the spines; but bearing in mind that these fine white spines seem to be - like *C. strausii* - rather hair-like in appearance, it may be that one might consider the Fric plant var. *nivalis* could be this high altitude *S. formosa*. Fric actually placed it as a variety of *S. bruchii*, but to date we have no evidence to suggest that white hair-like spines are to be found on high-altitude forms of *S. bruchii*."

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## TUCUMAN PROVINCE

The province of Tucuman lies in north-western Argentina astride the eastern flanks of the Andes, where the mountains rise up from the flat plain of the Gran Chaco.

The eastern edge of the Andean chain runs in a north to south direction through the provinces of Salta and Tucuman. The backbone of the eastern Andes is the Cordillera Real, a line of peaks rising to about 20,000 ft, amply justifying the title "Royal". The ground between the Cordillera Real and the lowlands of the Chaco to the east is occupied by chains or broken ranges of successively lower peaks, terminating in piedmont hills on the edge of the Chaco. These front ranges occur not only in Tucuman and Salta but also further north to the borders of Bolivia and beyond.

Just to the north of the city of Tucuman the piedmont hills come to an end in the Sierra Medina. The flanks of the high mountain chain of the Sierra de Aconquija to the south of the Sierra Medina run straight down to the edge of the lowland plain, on which the city of Tucuman is situated; further to the south this range splits into two, the Sierra de Ancasti and the Sierra de Ambato. From the peak of the Sierra de Aconquija at almost 17,000 ft to the edge of the lowlands, the whole east facing slope is open to the winds from the plains below.

In the province of Salta, to the north of Tucuman, the broad valley of the Rio Juramento opens a great gap in the front ranges of the Andes. This branches out into tributary valleys which reach as far as the flanks of the Cordillera Real itself. Almost the whole of the drainage basin of the Juramento is thus exposed, to some degree or other, to the winds blowing from the lowlands to the east. This is in marked contrast to Tucuman, where a major front range barricades the hinterland from the effects of the easterly winds.

During the period of high summer when the sun is close to the southern tropic, an intense low pressure area is developed over the Gran Chaco. This draws in moist air from both the north-west trades and from the South Atlantic. These air masses part company with most of their moisture in traversing the Chaco so that the plain adjacent to the Andean foothills receives barely 20" of rain for the year - as at Santiago del Estero. However, on reaching the flanks of the Andes this onflowing air must rise and this leads to the release of residual moisture. This appears as a band of rainfall on the mountain flanks. In the depths of the southern winter the sun is 47° of latitude away to the north and although the Chaco remains hot it attracts less inflowing air - and then only from the South Atlantic. The trade winds thus provide a high summer rainfall but very much less in winter.

A further source of rainfall is provided by the irregular bursts of sub-antarctic air which flow northwards up the eastern flanks of the Andes. Where these cold air masses meet and interact with moister subtropical air, thunderstorms and sudden localised downpours result bringing flash floods which come and go within the twenty four hours. This meeting of the different air masses takes place over the Pampas and the Chaco and especially along the flanks of the Andes over La Rioja and Catamarca. Thunderstorm rainfall also occurs, but to a somewhat lesser extent, in Tucuman and is even less important in Salta Province. There is more rainfall from this source during the summer months when fresh masses of warm subtropical air are constantly being drawn in to meet each new inflow of cool sub antarctic air.

Both orographic and thunderstorm rainfall is more plentiful during the summer months so that the region shown on the accompanying map receives more than half its annual rainfall during the three summer months from December to February. The orographic rainfall is concentrated largely into a band at about the 1,000 meter altitude mark, the line of which is marked on the accompanying map. To the east of this band lies the Chaco lowlands; while to the west band lies the high, bleak, rocky Andes which are almost devoid of vegetation; to the south lies the Salinas Grandes (described in the Chileans No. 19 p.191).

As one proceeds northwards from Mendoza and La Rioja with their desert-like climate, through Tucuman and over the border to the jungles of northern Bolivia, the annual rainfall steadily increases, from barely 10" per annum to over 70". The abrupt rise of the eastern edge of the Andes behind Tucuman city leads to an area of rather heavier rainfall ahead of the mountains, heavier than that received by the frontal ranges immediately to the north. Tucuman City itself



receives 38" of rainfall per annum and this relatively better rainfall occurs over about fifty miles of latitude on the plains at the foot of the mountains. However, this rainfall is confined to a narrow meridional zone and the total run-off is not sufficient to enable the Rio Sali (which it feeds) to flow across the Chaco to join the Rio Parana - it peters out half way across the Chaco plains.

The provincial town of Salta has a rainfall of 28" per annum; the various tributaries of the Rio Juramento feed sufficient water to enable this river to cross the Chaco plains and join the Rio Parana. This typifies the improvement in general rainfall as one goes northwards.

Within the narrow band on the eastern flanks which receives orographic precipitation, the total annual rainfall is markedly higher. There are no climatic stations giving statistical figures for this zone, but Angel L. Cabrera in *Fitogeografia de la Republica Argentina*, Bol.Soc.Arg. Bot. XIV, 1-2; 1971, quotes rainfall figures of between 37" and 105" depending on location. The same author quotes figures for average temperature of between 14°C and 26°C for this narrow rain zone. The average temperature recorded at Santiago del Estero at 650 ft altitude averages 13°C for winter and 28°C for summer; for Tucuman at 1,500 ft altitude 12°C for winter and 25°C for summer; and for Salta at 3,865 ft altitude 10°C and 22°C respectively. In consequence one might feel that the temperature figures quoted by Cabrera for the rainy zone, which will probably refer to about 3,000 ft altitude, are rather on the high side. This in turn leads one to wonder whether the rainfall figures quoted may not also be on the high side - after all, 105" is an astronomically high figure if one compares it with the bare 20" received by the immediately adjacent Chaco lowlands. Nevertheless, there is no doubt that the rainfall received in this narrow zone is several times that received either to the west or east of it.

The onflow of moist air ascending the eastern flanks of the Andes produces a bank of cloud of considerable depth against the mountainsides. During the summer rainy season this cloud layer will extend from about 3,000 ft to about 6,000 ft altitude - even higher on favourable slopes suitably orientated, lower on less favourable places. Even during the winter months, patches of cloud remain, varying considerably in depth, extent, and duration. It is this cloud layer which produces the narrow zone of heavy rainfall - but the cloud cover also conserves evaporation so that humidity is retained at a high level.

The conditions of temperature and rainfall within this narrow zone are favourable for the growth of a quite dense subtropical forest, which is described as montane selva. Unlike the tropical selva of the Amazon basin and Bahia coastlands, the montane selva not only has to survive a fairly dry season of the year but is also subjected to temperatures below freezing point - especially during the winter nights. The species of vegetation found in the montane selva thus differ from those in the tropical lowland and from those in the frost-free Bolivian montane forest. The montane selva in Tucuman also differs in character from lowland selva in being composed of trees of varying heights and having a dense undergrowth, rather like the cloud forest illustrated in Jean Dorst's "South America - A Natural History".

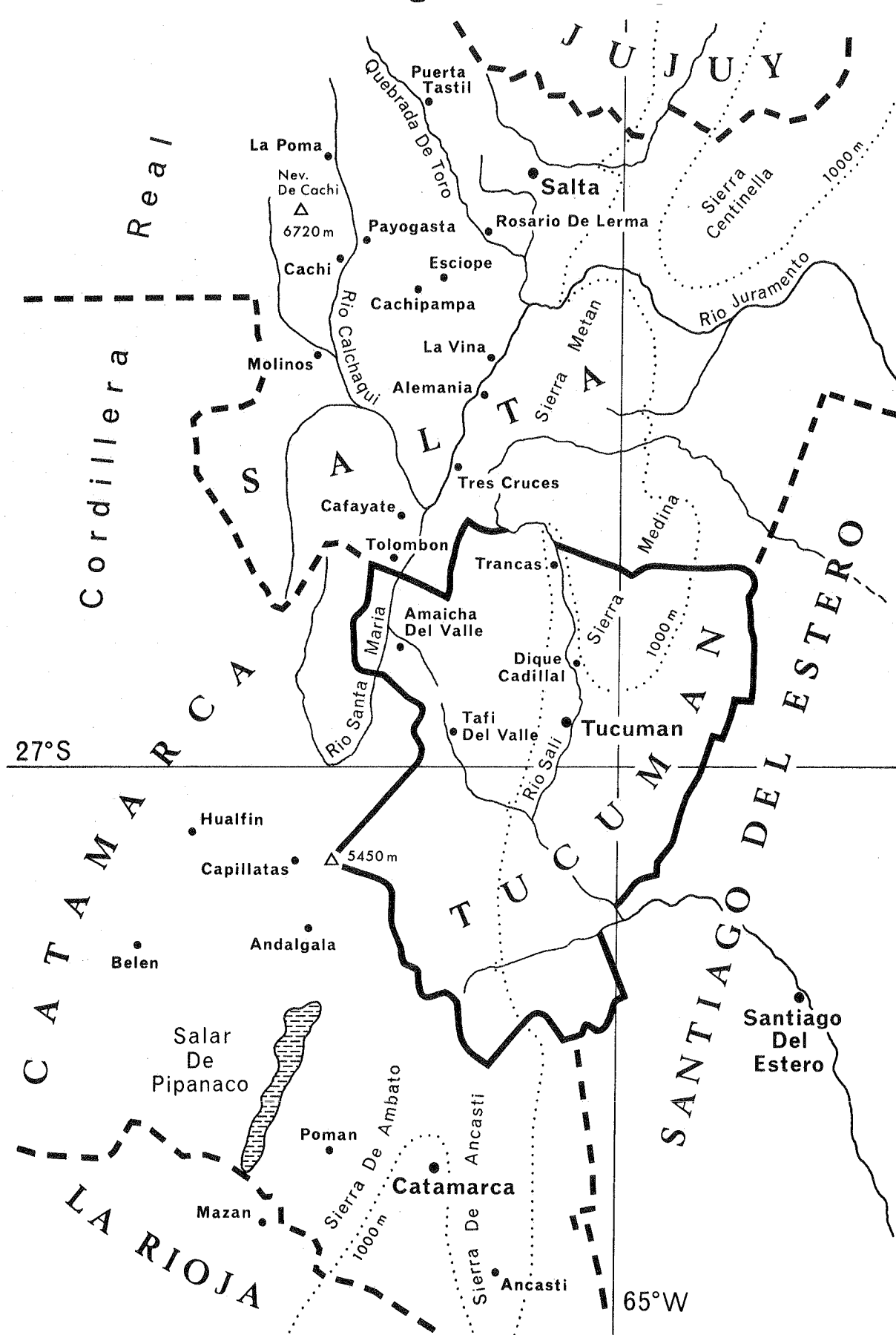
The taller trees rise in ones and twos above the remainder of the forest vegetation, from fifty to almost one hundred feet in height, such as :-

<i>Blepharocalyx gigantea</i>	<i>Rapanea laetivirens</i>
<i>Erythrina falcata</i>	<i>Juglans australis</i>
<i>Eugenia pungens</i>	<i>Ilex argentina</i>
<i>Phoebe porphyria</i>	<i>Cedrela lilloi</i>
<i>Piptadenia excelsa</i>	<i>Pseudocaryophyllus guili</i>

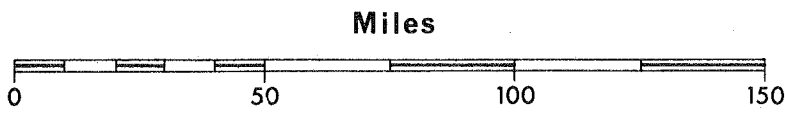
Next come the trees of about 30 - 40 ft in height such as:-

<i>Fagara coco</i>	<i>Prunus tucumanensis</i>
<i>Crinodendron tucumanum</i>	<i>Cupania vernalis</i>
<i>Azara salicifolia</i>	<i>Eugenia pungens</i>
<i>Rapanea ferruginea</i>	<i>Styrax subargentis</i>

# TUCUMAN Argentina



Linda Hampshire



Growing to about 15 - 25 ft in height are :-

<i>Bocconia pearcei</i>	<i>Sambucas peruvianus</i> HBK
<i>Cnicothanus lorentzii</i>	<i>Xylosma pubescens</i>
<i>Eugenia uniflora</i>	

and *Randia spinosa*, one of the very few thornbushes found in the montane selva.

Below these again come the low shrubs of under ten feet in height, such as :-

<i>Urera baccifera</i>	<i>Pavonia malvacea</i>
<i>Miconia ioneura</i>	<i>Cestrum lorentzianum</i>
<i>Piper tucumanum</i>	<i>Baccharis tucumanensis</i>
<i>Boehmeria caudata</i>	

and a bamboo *Chusquea lorentziana*.

Below the bushes are plants growing up to five feet high, such as the fern *Pteris deflexa*, and grasses such as *Phares glaber*, *Oplismenus hirtellus*, *Permugetum latifolium*, etc. Other plants have striking flowers such as *Begonia boliviana*, *B. micrathera*, *Seemannia gymnostoma*, *Polymnia connata*, *Senecio peregrinus*, *S. bomanii*, *Bomerea macrocephala*, etc. Between these there are even lower-growing plants such as *Blechnum sprucei*, *Equisetum bogotense*, *Iresine paniculata*, *Tibouchina paratropica*, *Elephantopus mollis* and many others. Finally at soil level one finds dwarf plants such as *Estrato muscinal*, *Selaginella nova-hollandiae*, and creepers like *Sibthorpia conspicua*, *Stellaria media*, *Hydrocotyle bonplandii*, various lycopodium and numerous species of mosses and lichens.

Lianas trail all around abundantly; there are various species of *Passiflora* - spp. *urnaefolia*, *tenuifolia*, *morifolia*, etc; *Mandevillea laxa* with handsome white flowers, *Doxantha unguiscati* with large yellow flowers and leaves partially formed into hooks; *Manettia joergensenii* with fine red flowers, and many more. The lianas very slowly strangle the tall trees just as Guenther describes so vividly in "A Naturalist in Brazil", so that the forest is littered with fallen tree trunks.

Epiphytes grow in abundance, especially upon the very tall *Phoebe porphyria*. Predominant amongst the epiphytes are the lichens, ferns, and bromeliads. Amongst these one may see *Aechmea distichantha*, *Vriesia friburgensis*, *Tillandsia maxima* and *T. schreiteri*, together with many cacti of the genus *Rhipsalis* and various orchids such as *Oncidium viperinum*, *Malaxis padillana*, *Epidendrum argentinense*, etc.

The base of the summer cloud layer lies at around 2,500/3,000 ft altitude; below this level those trees which are predominant in the Chaco begin to appear in small numbers, scattered in the selva. Below about 1,750 ft altitude the transition to the Chaco vegetation becomes more readily apparent, the trees being a fair mixture of the types met in both the selva and the chaco. In this vegetation zone the rainfall averages between 30" and 40" per annum. Here the epiphytes are perhaps rather less prolific than in the selva but the lianas are still numerous. In the north, towards the border with Bolivia, the "palo blanco" or *Phyllostylun rhamnoides* stands out above the rest of the vegetation; on the Sierras Ambato and Ancasti it is the *Tipuana tipu*, *Enterolobium contortisiliquum*, and *Piptadenia macrocarpa* which are prominent, being some 40 to 60 feet in height. With less rainfall, the tallest trees are barely half the height of the tallest trees in the selva.

The montane selva and the transition selvas are found on the eastern flanks of the Sierras Ancasti and Ambato, thence more or less following the 1,000 meter contour through Tucuman and thence directly northwards to the Juramento, also on the windward flanks of the Sierra Medina and Sierra de Metan. This pattern is repeated on the windward flanks of the Sierra de Centinela and the main precordillera in Jujuy, as far as Yacuiba (Chileans No. 21 p.78). From Rosario de Lerma, the downstream Juramento valley is also occupied by transition selva.

On the mountainsides above the selva, up to almost 8,000 ft in altitude, there occurs the "Bosques", patches of forest or patches of grassland, containing very few species of trees, viz:- *Alnus jonillensis* v. *spachii*, *Azara salicifolia*, *Podocarpus parlatorei*, *Sambucus peruviana* and the quenoa or *Polylepis australis* which occurs alone in a stunted form at the upper limit of the tree line. Amongst the grasses found in the "Bosques" are *Festuca hieronymi*, *Deyeuxia rosea*, *D. polygama*, *Chloris distichopylla*, *Lamphrothyrus hieronymi*, *Paspalum lineispatha*, etc. There are also numerous fine flowers, like the magnificent *Cosmos pencedanifolius*, *Lippia tumerifolia*, *Amicia medicagnea*, *Calceolaria teucroides*, *Bidens andicola*, and various species of *Stevia*, *Gentianella*, *Polygala*, *Baccharis*, *Tagetes*, *Salvia*, etc.

Within the pre-cordilleras, the Rio Santa Maria flows in a deep valley almost directly northwards from about 27°S latitude to the junction with the Quebrada de Toro. The steep rise of the western wall of this valley does extract a little moisture from the rising air, sufficient to support the sparse growth of various stunted forms of hardwood trees which also occur in the Chaco. This fairly narrow band of "Monte" vegetation runs up the side of the valley from about 27°S, past Cafayate and Salta and even further northwards up the Humahuaca valley in the Province of Jujuy. This band of monte vegetation is broken by various tributary valleys of the Juramento; monte is also found on the leeward slopes of the front ranges of the Sierra Medina, Sierra Metan, etc. Patches of monte are also found in the extensive upland basin centred on the Salar do Pipanaco which is roughly bounded by Mazan - Belen - Andalgala - Poman.

Cacti are found growing both in company with the xerophytic monte vegetation and in the even drier regions clothed only by sparse grasses and occasionally other low bushes. Other than epiphytes, cacti do not grow in the zone of the montane selva, which thus forms an almost unbroken dividing line on the windward eastern flanks of the Andes between the upland and lowland cacti. *Lobivia*, *Sulcorebutia*, *Weingartia*, *Rebutia*, *Aylostera*, *Mediolobivia*, *Parodia* and *Pseudolobivia* are found almost exclusively on the high Andes to the west of the selva band. It is, however, interesting to note that species of *Gymnocalycium* are to be found both in the interior of the Andes to the leeward of the selva and also in the lowlands to the east. There would appear to be some form of division between the species of *Gymno* of the group *Muscosemineae* in the lowlands and those of the *Microsemineae* group - specifically *G. spegazzinii*, *bayrianum*, *cardenasianum*, and *G. saglionis* - on the highlands.

However, as discussed in Chileans No.21, there are examples from the *Microsemineae* such as *G. pflanzii* which do occur in the Chaco lowlands of Bolivia, while on the other hand seed of Lau 397 is awaited to see if the *Muscosemineae* occur in the pre-cordillera of Bolivia. Likewise the identification by Rausch of *Gymno.marsoneri* in the Quebrada del Toro places yet another probably *Gymno*. of the *Muscosemineae* group to the leeward of the montane selva strip.

There does appear to be more transition from highland to lowland species in the *Gymnocalycium* in the region from the south of Catamarca Province, through La Rioja Province to Cordoba - but there is no montane selva in this region to impede transition.

Numerous discovery locations for species listed in the Rausch (R) and Lau field numbers in our 1972 Year Book may be determined from the accompanying map.

H.M.

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DISCOCACTUS TRICORNIS Monv. by Pierre Mingard

(Translated from *Dodonaeus* 6.6: 1968 by H. Middleditch).

Having always been particularly attracted by reputedly difficult species, I naturally wished to interest myself in the *Discocactus* of which Uebelmann offered a remarkable choice last year.

Indeed, amongst the incomparable range of new species discovered recently in Brazil by Messrs Buining, Horst, Uebelmann, etc..... one finds almost ten species of *Discocactus*, all

equally unusual.

As for a good many of these plants, I am of a different opinion to that which one may usually read in classical literature concerning cultivation, notably when it has been stated for a long time that *Melocactus* and *Discocactus* do not produce roots when they carry a cephalium. Such a theory is often only an inference from a trial carried out with a small number of specimens and without the necessary exactitude. When one considers the popular works, one may find that for almost every species we are proffered a different method of cultivation. Many trials over recent years have demonstrated the absurdity of multiplying the cultural methods for plants in a single collection.

In spite of all that one may read or write, I will now offer you my own personal opinions.

In habitat one may encounter three groups of plants that are most particular about soils:-

1. Plants adapted to alkaline soil and for which a supply of lime is advantageous or necessary. (*Ariocarpus*, *Leuchtenbergia*, *Neogomesia*, etc.)
2. Plants more or less indifferent to the presence of lime (*Mammillaria*, etc.)
3. Plants disliking alkalinity and which require a plainly acid soil (peat etc.) entirely free of lime in the form of calcium carbonate (granitic or volcanic terrain, etc.). These plants prefer soil of which the pH is generally below 5 and often even near to pH 3.5 to 4 (which is the case for almost all the Brazilian cacti).

Traces of lime in their compost - in the sand of our mixtures, in sprayed water - constitute a real poison for this last class of plants and if one persists in keeping them on their own roots in such conditions, they are doomed to a most certain death, often very soon.

It is not very difficult to obtain composts with a pH below 5 and without a trace of lime, but on the other hand it is much more difficult to keep them like that, and I am convinced that the principal reason for failures is very closely connected with this problem.

Backeberg wrote quite definitely that one could not keep these imported plants (*Discocactus*) for long. Has it occurred to this writer or to one of our predecessors amongst other amateur growers of cacti to analyse the soil which one may remove from imported plants, even if all the roots have been cut off? Dr. Locuty, who has prepared a soluble fertiliser, has lately had the opportunity to analyse 30 samples of earth lifted off plants which Mr. Uebelmann has brought back from Brazil. All these soils had a pH varying between 3.5 and 5 and in each case there was not the least trace of lime apparent.

For the three years which I have owned my *Discocactus tricornis*, growing perfectly and flowering regularly, I have been won over by these singular plants and my collection is being enriched by more new species in 1968. The flower of *Discocactus* is to be found among the most unusual that one may observe. Just like the *Melocactus*, they develop, expand, and wither very rapidly, but they are of much larger dimensions and are nocturnal. They are among the most scented of the family and I have even detected their scent in my garden more than 10 meters from the greenhouse! The fragrance of *Discocactus tricornis* recalls that of lavender; another species, possessing only a reference number, gave out a scent similar to that of roses. The flowers are already withering towards 6.0 o'clock in the morning and in order to obtain seeds it is necessary to get up early, split the flower in two vertically to gain access to the style which does not reach anything like the height of the flower tube (at least for *D. tricornis*). The pollen of the same flower will serve for fertilisation, but external intervention is required.

Two species of *Discocactus* were already known in the first part of the last century. In 1900 three new species were discovered and in 1922 Britton and Rose had discovered a further three.

*Discocactus tricornis* had already been described by Dietrich in 1846 under the name of *Echinocactus tricornis*, although the genus *Discocactus* had been diagnosed by Pfeiffer in 1837:-

Body strongly depressed, globular; 10 ribs or more, upright or sometimes in spirals, wrinkled transversely and shaped into tubercles, usually large and not very high; cephalium up to 50 mm in diam.

Areoles carrying 3 main spines directed downwards, brown (in my three examples grey-black - P.M.) the longest pointing downwards along the rib, irregularly curved or more or less twisted. At the crown of the plant, the spines are stronger, adpressed or more or less rounded off like a keel. Often three secondary spines towards the top, much shorter and finer, particularly the middle one. The central spine is often lacking or only occurs at the crown of the plant, more incurved than the others.

Flowers of an uncommon form, in elongated funnel shape, up to 80 mm long and 70 mm across. Petals lineate-lanceolate; the tips sometimes rounded off, interior petals slightly shorter than the exterior. The scales on the tube are curled back towards the base, thus making numerous levels.

Style short. Fruit round, white or pinky-white, splitting laterally. Seeds 2 mm in diameter, black, finely tubercled.

Habitat. Brazil; according to Voll, near to Diamantina.

#### Comments on *Discocactus tricornis*

..... from Mrs A. Lavender.

"Our plant of *Discocactus tricornis* was obtained from Clive Innes in the autumn of 1971. It still possessed a number of main roots which had been cut back and were in good condition. It was planted up on a very gritty compost and after allowing a few days for it to settle down it was watered quite frequently; it has been kept in the hot box since receipt and when I unpotted it to see how it was getting along in early Spring 1972 it had developed a good new root system.

"A cephalium is just starting to form in the crown of the plant, which seems to match very well the description given above. The body is a rich deep green colour, the height being about a third of the diameter. The areoles do carry three main spines which are perhaps  $1\frac{1}{2}$  mm broad at the base, somewhat flattened, greyish black in colour, pointing generally downwards but also twisting in various manners."

..... from R. Ginns.

"The fable that Brazilian cacti must have a lime-free, acid soil has been repeated so often that most people believe it. It is like Lewis Carroll wrote in the *Hunting of the Snark*; "what I tell you three times is true."

"Water here has a hardness of  $24^{\circ}$  and my cacti are watered with tap water. It is impossible to grow heathers or rhododendrons in the garden - yet all my cacti are grown with compost from the garden apart from the addition of Bedfordshire silver sand. Thus my compost is certainly not acid and plants are on their own roots. Buxbaum says that *Rebutias* are short lived, best grafted and must have acid soil yet my oldest cactus is a *Rebutia violaciflora*, on its own roots, imported as a flowering plant in 1948 from California and still in good condition. I have most species of *Noto-cactus* and *Gymnocalycium*, many *Parodias* and *Neoporterias* besides columnar Brazilians, some grown for over 20 years and none in an acid compost. The sooner the "acid" myth is forgotten the better.

"I bought *Discocactus tricornis* from Holly Gate last autumn. It is now so firmly rooted that the plant and pot can be lifted by grasping the plant only. Compost as above - leaf mould from the garden plus silver sand. Minimum temperature  $55^{\circ}\text{F}$ .

"Habitat conditions are not applicable to pot grown plants although a knowledge of them may be helpful in some cases."

..... from H. Middleditch.

"I would not feel able to subscribe to the idea that all the comments and observations regarding an acid compost are a "myth". We had the pleasure of visiting Dr. Locuty at Thun (who is mentioned in the above article) on our 1971 Cactus Tour. Not only was his own collection an excellent demonstration of the benefits to be gained by maintaining an acid compost by means of a liquid feed of suitable formulation, but as he is a chemist by profession and should be quite competent to determine soil pH values, I for one will accept that the soil which came off the plants imported from Brazil which he tested was indeed the pH values he quoted.

"On the other hand I cannot accept that Ron Ginn's compost "is certainly not acid" - unless and until he has had it checked, preferably by an electrical soil tester designed to check free hydrogen ions although a reasonable approximation could be obtained with a BDH or similar soil testing kit."

..... from B. Chudleigh.

"I did manage to fool a Discocactus into flowering in the afternoon by putting it in a cool cupboard in the bathroom the morning it began to develop quickly and I was able to obtain a slide of the flower. The mature bud develops very rapidly in its last day."

(The town of Diamantina will be found on the map of Eastern Brazil which appeared in the Chileans No.22).

Any further observations on acid soils would be welcome from members who use an acid feed for their plants.

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We have slides of one or two Discocactus in flower - any additions will be welcome - A.W.C.

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## THE GENUS PARODIA SPEGAZZINI by F. Brandt

(Translated by R. Moreton).

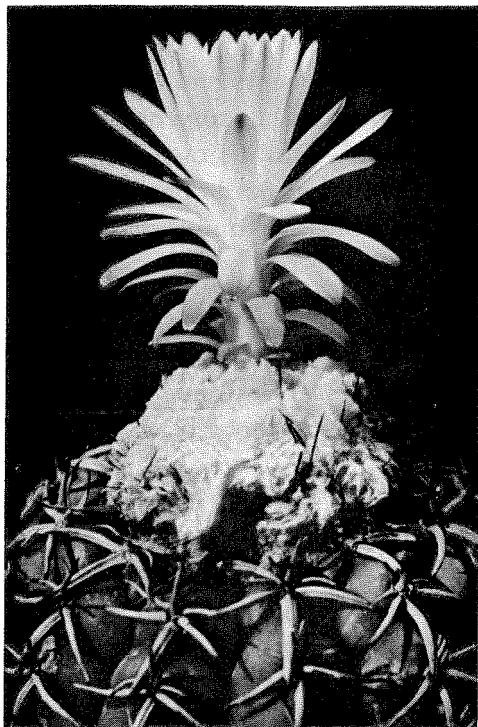
Among collectors of Parodias one finds views expressed which are in complete contradiction to the actual circumstances in which this genus occurs. Thus it is almost always said by Parodia collectors that there are already far too many species in the genus !

Consequently, too many new descriptions have already been undertaken, although the authors thereby completely overlook the fact of how large the total area of distribution of the genus Parodia is. The opinions expressed by most collectors in this respect are based usually on the fact that they have no overall view of the whole area from which the genus comes, and it can scarcely be demonstrated how large this area really is.

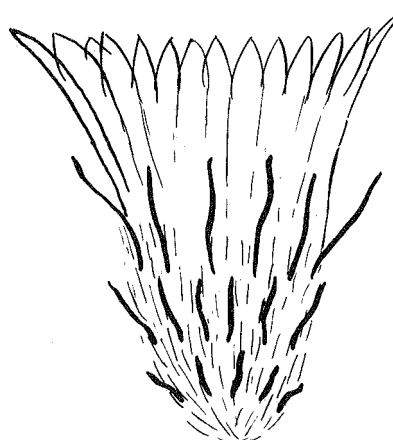
It must be particularly considered in this connection that the whole gigantic area where Parodias occur stretches in an almost straight line from 15°S to right down to the south, where it ends at the 29th degree of latitude. It comprises therefore many thousands of square miles, almost 14 degrees of latitude in a direct north-south line.

Thus it must be understandable to all collectors that this gigantic area of land cannot be treated as one uniform stretch of country. Not only does the landscape change in character continuously, but the climate also undergoes great changes and all this is naturally reflected, in the separate species of the genus and in their enormous variety.

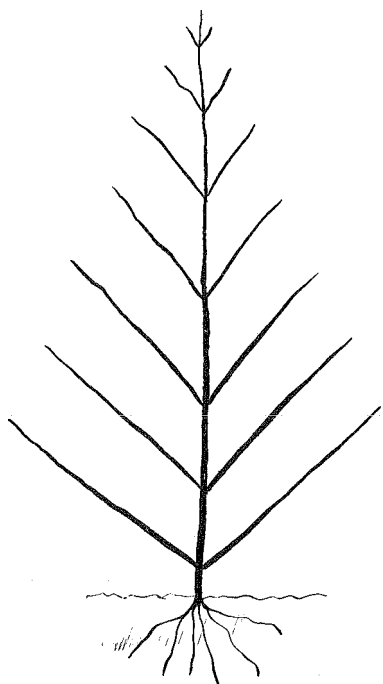
The northern part of their range, where the vegetation met with is almost unbroken forest and which has a tropical climate, where only small and meagre rocky slopes on the sides of river valleys



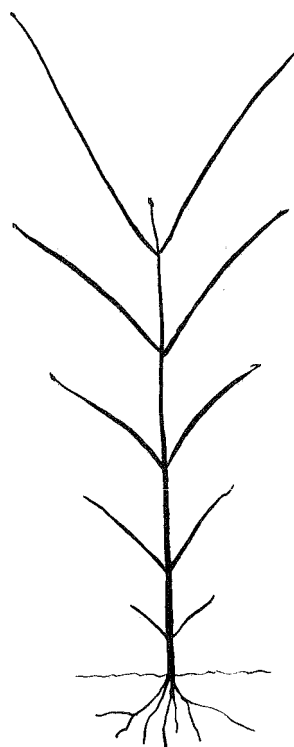
Discocactus tricornis  
DODONAEUS 6. 6: 68



Acrotomy of bristles  
on Parodia flower



Basitonous  
Growth  
(Basitony)



Acrotonous  
Growth  
(Acrotony)



offer *Parodias* some possibility of existence, is the place where they are first encountered. Further south, lighter but drier steppe-land and forest is found, which give *Parodias* much better living conditions. Then the forest shrinks to isolated stands of trees and a dry steppe-land of the high mountains develops, where only occasional low trees and shrubs are to be seen, which are scarcely able to bestow the often required shade. Slowly, as one goes further south, even this sparse vegetation disappears and the countryside is transformed into desolate steppes, where hardly a shrub or tree is to be found.

Anyone who has ever travelled the thousands of miles by foot or on a mule or camel, through the unending deserts, steppes and mountains of the still undisturbed parts of our Earth, will learn to understand it in all its peculiarities and oddities, as one can never comprehend from a desk. Not even as an idea will one be able to grasp it, since one must first have experienced it oneself in order fully to appreciate it. One often comprehends first how restricted the areas of distribution of a species can be and often are. That a few dozen miles is sufficient to permit a completely different flora. Even on the best maps one will learn nothing of these tiny nuances of nature, neither will one find them indicated anywhere else. Thus one mile or especially one square mile on the map is only a tiny dot, but in nature conceals thousands of forms of life within it. On this little dot on the best map there can be not just one *Parodia* species but a great many of them, which a collector making one crossing will not and cannot conceive of. One must cross and re-cross the area, searching everywhere, often taking all day and even then one cannot say "I have seen and found everything there."

I want to give to the interested collector a small concept of how small one square mile is on the map and how big it can be in reality, if one wishes to understand it, systematically and as a collector, on foot. In our particular case there is not just one square mile, but many thousands of them.

Up to now, in Bolivia, only one area has been systematically explored for *Parodias* and other cacti. This lies between the towns Camargo-Cotagaita-Tupiza-Tarija and comprises scarcely 40 square miles. But look at what has come into our collections just from there! One can still not say there is nothing more to be found there, since the area is still being continuously explored. There are still *Parodias* to be found there, which so far have remained unnoticed or unrecognised by collectors. There will always be species which have eluded the eagle eye of the collector.

In this connection there comes to mind particularly the neighbourhood of the town Tarija, from where hardly anything has been shown to come, yet this territory ought to interest us straight away, since it is the dividing line between the subgenera *Parodia* and *Protoparodia*, described by Buxbaum.

In his *Lexikon* Backeberg shows on page 667, ill. 319, a red flowered *Parodia*, which he saw in the collection of Saint-Pie and which comes very close to the group of species around *Parodia aurespina* Backg. and which is obviously only a variety of that species! Also Rausch said in a letter that he had seen near Tarija a *Parodia* species with almost black spines and large red flowers. These plants could also belong to the subgenus *Parodia* and thereby extend the known distribution areas of the subgenus *Parodia* still further north, into Bolivia.

That the dividing line between the two subgenera of *Parodias* is located near Tarija, as put forward by Buxbaum, is plainly demonstrated by the *formosa* group, which in their whole build belong almost exclusively to the subgenus *Parodia*, although the most northerly members of the group already show variations towards the subgenus *Protoparodia*! At the same time it is interesting to note that in this whole area of the *formosa* group there has been not a solitary find of a species of the pure subgenus *Protoparodia*. Thus the *formosa* group all alone appears to have taken over this gigantic area of O'Connor province all for itself, then to have pushed still further north, as far as 'Salinos' in Cordillero province, where the species *chaetocarpa* Ritt. alone has its habitat. There however, begins the slow transition from the pure *formosa* species of the subgenus *Parodia* to the species of the subgenus *Protoparodia*!

Here it is interesting to note that the area of the subgenus *Parodia*, to the south-east and east

of the precipitous slopes of the Cordilleras, which descend here, is still colonised by the subgenus *Parodia* and its transitional forms, whereas in the similar more northerly highlands, the ridges and high plateaus of the Cordilleras have been colonised exclusively by species of the subgenus *Protoparodia* !

From a thorough consideration of these facts one can discern that the subgenus *Parodia* has its home in the low mountains of the Andes and the Cordilleras, the species of the subgenus *Protoparodia* however have colonised the higher places of these mountains. The same picture is found in Argentina, where in the high mountain areas almost only the subgenus *Protoparodia* is to be found, lower down though the subgenus *Parodia* dominates, to far down in the south, where the most southerly find so far has been from La Rioja. This by no means proves however that *Parodias* do not grow any further south ! I take it as almost certain that *Parodias* can be found in the even more southerly provinces of the country, only that there the long-spined imposing species of the Bolivian Cordilleras will be missing. Instead of those the small-tubercled species of the subgenus *Parodia* may be met with.

With this, my survey-map of the occurrence of the genus *Parodia* and the systematically arranged part of the text, I want to give a basic summary of all *Parodia* species and thereby lay a foundation stone upon which other scientifically minded *Parodia* collectors can build. It is thought of as a sort of 'basis' of the genus *Parodia*, which is systematically arranged, according to the current knowledge of the subject, as well as following the arrangement of subgenera as set up by Buxbaum.

That this systematic arrangement of the *Parodias* which I have made still does not represent a final position, I well know, but on the basis of this work, which is a summary of all so far known species, as well as good but not yet validly described *nom.nud.* is a summary which by bringing together all that is so far known about this genus lays the basis for further good solid work.

In the discussion of the individual species and their habitats which follows, I want to make a start with the species which grows at the most northerly point of the presently known distribution ! This point, laid down by me today as the most northerly point of the distribution of the *Parodias*, still does not mean that there may not be yet another *Parodia* even further north ! It has not so far been found.

Comments from H. Middleditch.

"The writer refers to many "species" growing within a limited area as a practical possibility. However, it does seem likely that most botanical writers would, except on rare occasions, regard such diversity within a small compass as merely representative of natural variation, and to be regarded as varieties or forms rather than species. This is not to say that the visible differences are without interest to the amateur collector, rather do they demonstrate the infinite variety of nature."

..... from J.D. Donald.

"*Parodias* do not have a monopoly in having a broad geographical distribution. *Notocactus* and *Gymnocalycium*, especially the latter, have an even larger distribution. It is not surprising that one can find different types of *Parodia* occupying different ecological niches - it is the same for any large genus of wide distribution. The two subgenera of *Parodia* with their associated sections clearly demonstrate an ability to evolve along certain preferable lines that assure successful survival in the particular environment encountered. Thus you have the highland and lowland, *Protoparodia* and *Parodia*, respectively dominating these two distinct ecological zones.

"The apparent tremendous variety that exists on the ground, with extremely local distribution, is shared with other genera such as *Lobivia* and *Rebutia* which occupy similar ecological niches, again with highland and lowland types. A very similar state of affairs also exists in central and northern Peru with the *Borzicactinae*, and in Chile and southern Peru with the *Neoporteriae*.

"What is a species, a variety, or a form is a perennial question. Often a decision is made purely arbitrarily. Both Ritter and Buxbaum have written extensively on this theme in relation to the Cactaceae, and they come to quite different conclusions. Ritter favours a multispecific generic classification while Buxbaum favours a much more closely woven phylogenetic system where sharp divisions are avoided. Ritter believes any true breeding self replicating isolated population could be a species, very rarely a variety. Buxbaum believes in species covering a large number of such populations.

"My own personal feelings favour a much larger specific concept with much broader criteria for its make up, hence I am one of those who says that there are too many existing species in *Parodia* etc. But I do not say that there are no new species yet to discover."

..... further from H. Middleditch.

"The seed study by D.J.Lewis of a wide range of *Parodia* species demonstrated that these could be considered in two major groups - the small seeds and the larger seeds. This division conforms with the Buxbaum subgenera of *Parodia* (small seeds) and *Protoparodia* (large seeds). However, I find myself somewhat puzzled by John Donald's reference to these two divisions as highland and lowland types. Available literature and a comprehensive plot of all *Parodia* growing places on a large-scale map by F.H.Brandt would suggest that all *Parodia* emanate from the high Andes - although some come from higher altitudes than others, but this does not seem to be closely related to the basic seed size or subgeneric division."

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## THE GENUS PARODIA by F. Buxbaum

(Translated by P. Waterman from *Die Kakteen*, 1. IX:66).

### Key to seed groups

A Seed less than 0.5mm., spherical with a polished light brown testa. The seeds often have an extremely large strophiole. Flower with a  $\pm$  funnel-shaped receptacle. The axis of the scales of the receptacle and most of those of the pericarp (when present) bear wool, hair and needle-like spines (i.e. the areoles of the receptacle and pericarp). Only inferior acrotony. Fruit small, thin-walled and dry.

### Subgenus:- PARODIA Speg.

(Type sp. - *P. microsperma* (Web) Speg.)

AA Seed black to brown-black with a warty testa (only in *P. columnaris* is it brown and polished) elongated, cap-shaped, curved, oval to almost spherical. Strophiole small (larger in *P. stuemeri* and *P. faustiana*) strongest in the region of the micropyle and continuing to the base of the funicular opening which is less raised (reversed in one species) and rarely both equally evolved (*P. faustiana* and *P. ocampoii*). Flower variable but always distinctly acrotonic (and more elongated than in sub-genus *Parodia*) with the exception of *P. chrysacanthion*. Most contain needle-like bristles only in the areoles of the upper receptacle, or at least stronger in that region. Fruit as in subgenus *Parodia*.\*

\* *Proto parodia* (error in mss)

Subgenus:- PROTOPARODIA F. Buxbaum subgen.nov.

(Type sp. - *P. maassii* (Heese) Berger)

- B 1. Flower very large and extremely acrotonic, the petals are only split above the level of the receptacle. Needle-like bristles arise from the axis of the scales on the margin of the receptacle. Seed hemispherical to broad oval.

Series:- MACRANTHAE F. Buxbaum ser. nov.

(Type sp. - *P. maassii* (Heese) Berger)

- B 2. Acrotony of bloom weaker, needle-like bristles present in the areoles of the upper region of the receptacle.

- C 1 Seed oblong, <sup>+</sup> curved.

Series:- OBLONGISPERMAE F. Buxbaum ser. nov.

(Type sp. - *P. comarapana* Cardenas)

- C 2 Seed hemispherical to globular, or broad oval.

Series:- BRACHYSPERMAE F. Buxbaum ser.nov.

(Type sp. - *P. schwebsiana* (Werd) Backbg)

- AAA Seed approx. hemispherical with a pad-like hemispherical hilum. It is covered by an aril membrane (brown) through which the rough warty testa cuts in star shapes (parts of the membrane are still present). The flower has a very thick coat of hair and wool etc., the wool being white in the inner regions and brown above. There are two types of hair, a stretched over-covering zone with short crisp hair beneath it. Very pronounced acrotony. Only in the axils of the scales of the upper receptacle are needle-like bristles to be found, these being included in the dense upper hair covering. Fruit red, hairy, tube-shaped and much elongated (with isolated short fruit). Upper part of the elongated fruit empty.

Subgenus:- OBTEXTOSPERMA F. Buxbaum, subgen. nova.

(Type Species:- *P. ayopayana* Cardenas)

Subgenus Parodia

Mostly small spherical plants with or without hooked spines.

Flower <sup>+</sup> funnel-shaped, usually opening wide. Exhibits only inferior acrotony. All the scales in the area of the receptacle and pericarp (where the pericarp is not naked) bearing in the axils wool, hair and needle-like bristles. Toward the throat the needle-like bristles are longer and stronger.

The thin walled, dry fruit contains an unusually large number of very small seed (av. diam., 0.2 mm). The seed have a large roundish projecting strophiole and a shiny brown testa.

Type Sp. - *P. microsperma* (Web) Spieg.

Habitat: Mainly in N. Argentina.

Subgenus Protoparodia

Very variable in both habit and bloom. The flower is (with the exception of *P. chrysacanthion*) very strongly acrotonic with needle-like bristles only from the upper or central axils of the receptacle. Where they are present lower down they give rise to a weaker acrotonic structure.

Seed black or brown-black, <sup>±</sup> shiny, warty, usually over 0.5 mm (except *P. columnaris* which has very small, spherical seed and a shiny testa but with the characteristic small strophiole of this subgenera and showing the typical acrotony in the bloom).

Strophiole mostly small (only known exceptions are *P. steumeri*, *P. faustiana* and *P. chrysacanthion*, the latter being remarkably elongated in section through the region of the funicle.) It is characteristically more raised in the micropylar positions; or both may be equally raised; only *P. faustiana*, *P. ocampo* and *P. chrysacanthion* (occasionally) are stronger in the funicle region.

### Series Macranthae

Large plants, up to 15 cm thick and 30 cm high, with a maximum of 21 sturdy notched ribs, spiralled in the older specimens. Rather stouter spines, the centrals being thicker, variably twisted or curved or hooked; seldom straight.

Large flower <sup>±</sup> bell-shaped, the axils of the scales of both the pericarp and the receptacle having thick wool and hair but with needle-like bristles only from the upper scales of the receptacle, these being long and sturdy.

Seed half-round to ovoid (broad egg-shaped) with a coarse, tubercled matt-black testa. The hilum is not greatly raised with an area covering both the micropyle and funicle; the former being somewhat higher than the step-like funicle.

Habitat: S. Bolivia and north Argentina in very high regions.

### Series Oblongispermae

Spherical to short columnar, occasionally clustering at the base. Spines are variable.

Flower narrow, with an almost tubular appearance. Scales of the pericarp considerably elongated.

Seed much elongated, ovoid, <sup>±</sup> curved with a tubercled testa (the tubercles being in rows). The tubercles are oval or elongated. Strophiole small. Embryo long, egg-shaped with small but distinct cotyledons.

### Series Brachyspermae

Habit variable. Seed ovoid to round, black and coarse with either rounded or very elongated (streak-like) testa (except *P. columnaris* which has a shiny brown testa).

Hilum similar to those of the series *Macranthae* or it may have a very strong funicle region (like a molar tooth). In *P. columnaris* the hilum is relatively small, bipartite.

Habitat: Mainly S. Bolivia, north of the area of *SG Parodia* and overlapping this.

### Subgenus Obtextosperma

Single, seldom woolly or branching; with strongly notched ribs. Upper areoles strongly woolly but later <sup>±</sup> naked. Radials usually close to the plant, spreading, needle-like. Approx. 4 centrals, spreading, almost awl-shaped, straight or curved.

Flower with a very strong covering of hair, thick wool and some spreading over the rest. The wool ranges from white to brown, the brown being over the top and at the top. Only on the upper scales of the receptacle are to be found brown needle-like bristles, these tending to be submerged in the brown hair cover.

Fruit red, hairy and singularly elongated into a tube. Seed only being found in the lower parts of these fruits. Fruit that are not elongated are often found side by side with the above.

Seed differ from all other *Parodia* in that they possess an aril membrane covering the surface of the spherical seed. The tips of the small black tubercles project through the membrane in a stellate slit (the membrane being transparent). Parts of the covering membrane remain on the seed

so that it has the appearance of being enmeshed in a web.

The flattish, hemispherical hilum arches into a pillow-shape, the covering membrane making it symmetrical, with the funicle appearing at a somewhat lower level than the micropyle.

Habitat: The only sp. so far acknowledged is found in Bolivia, in the Ayopaya Prov. of the Cochabamba Dept. of Bolivia in the far north of the Parodia area up to 2700 m.

Now a short consideration of the ecological significance of the subgenus Parodia of Parodia.

If you place seed of the above in water you will note that they float for a very considerable period of time. In view of the very small size of the seed and of the seedlings on the ground it would seem likely that they are very vulnerable.

However, owing to the flotation apparatus (e.g. the hilum) this is overcome for the seed once floating will continue to do so until the water gives out (presumed to mean evaporates or the stream dries up - P.W.) when the seed will be laid down having reached, through the medium of the water, a broad area of distribution.

This condition may explain why there are different evolutionary lines i.e. in comparison with Mamillaria subgenus Phellosperma, a coarse large seeded type with a large corky hilum.

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Comments from H. Middleditch.

"In the Chileans No. 16 the results of a comprehensive survey of over a hundred sorts of Parodia seed were presented by D.J. Lewis together with sketches of the different shapes and sizes of seed which are found within this genus. This was followed by an article in The Chileans No. 17 pp 91-96 by De Cocker who had also surveyed many species of Parodia seeds and presented his conclusions with photographs of various types of seeds. The above article by Buxbaum covers the same field and it will be found that there is a wide band of agreement between the three articles.

"It would appear that the groups of species set out in these articles exhibit, within each group, an appreciable degree of similarity in both seed and body habit. Most of us could probably distinguish a maasil type plant from a microsperma type, but with this system every Parodia could be allocated to a specific section or group of species. To identify an unknown plant, therefore, the first step would be to place it into the appropriate group, thereby greatly reducing the number of possible names to be considered. "

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## ACROTONY

In the above article on Parodia classification by Buxbaum, the term 'acrotony' is used in referring to the needle-like bristles carried on the exterior of the flower tube. The precise meaning of this term was not self-evident on examination of the flower sketches which accompanied the original article and reference to Buxbaum's 'Morphology of Cacti' likewise failed to yield any clarification of the term.

However, G.J. Swales produced the following reference from 'Textbook of Botany' by Strasburger, 1965 pp 124-5, regarding the position of the active buds on their parent axis:-

"Except for many herbs, only a small number of the buds on a parent axis (=stem - G.J.S.) expand into shoots . . . . In the richly branched shoot stems of most trees the peripheral buds i.e. those nearer the tips of the branches, are preferentially stimulated into growth (acrotony) . . . . In shrubs and perennial herbs, on the other hand, the buds at the lower end, or in the middle of the parent axis, tend to develop rather than those elsewhere (basitony and mesotony respectively)".

G.J. Swales goes on to say "the example illustrated is *Ulmus carpinifolia* - one of the Elms (much modified from Strassburger Fig. 170 p.124). The sketch of the stem growth in its second year shows the acrotonous development of buds: the further away from the terminal bud, the less the axillary buds have developed.

"Buxbaum has used this term with reference to the needle-like bristles (grannenborsten) which are one of the diagnostic features distinguishing between *Parodia* and *Protoparodia*. If one looks at the right hand sketch accompanying these notes and substitutes floral axis for the main branch, receptacular and pericarpellary scales for leaves, then the lateral branches can be equated to the 'needle-like bristles', longer at the top than at the bottom.

"I personally consider that the use of the term is quite superfluous and serves no useful purpose but Buxbaum is obviously one of the old school of morphologists and uses their complex terminology. On the other hand, the paper was intended for the specialist rather than the amateur collector."

On a number of *Neochilenia* which flowered quite profusely this year, I did observe that the hairy bristles in the axils of the scales were markedly longer in the uppermost scales than lower down the pericarp. It would seem that acrotony might have been a fairly convenient term to have used to describe this sort of characteristic.

H.M.

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RAUSCH & ZECHER on a pH Safari in SOUTH AMERICA by G. Streiter.

(Translated by E.W. Bentley from the G.O.K. Newsletter for February 1971).

Herr Ernst Zecher gave a slide lecture on his South American journey with Walter Rausch. Seven months in South America - 1500 Km by car or other vehicle - 1200 Km tramping on foot up hill and down dale, collecting such a rich harvest of transparencies that the enthusiastic audience's eyes popped out. The enthusiasm was fully justified for I can vouchsafe that Herr Zecher (like friend Rausch) is a splendid photographer and that many of his pictures, whether of an amusing episode from the routine explorations of our friends, or a cactus portrait in habitat, remain for me unforgotten. For example: *Eulychnia ritteri* in a desolate stone-waste of a Peruvian Andes valley and behind it in fantastic three-dimensional illumination a marvellously coloured rock backdrop from which dangled a *Haageocereus*.

Or *Tephrocactus* with the Rausch collection number 428: the camera catches from fairly close-up a portion of the giant clump, so that the yellowish woolly branches press head on head, filling the picture (like a "Tapestry motif").

Or a landscape, charged with dramatic art: "The rainy season begins" - with dark, threatening thunder clouds over the peaks of the Andes, a black wall of rain overhangs the valley (which brought with it 1 cm of hail).

Or: before a block of rock *Gymnocalycium millaresii* and *Weingartia lanata* growing harmoniously together "Like little brother and little sister". And much more. You should see it for yourself! Informative maps and diagrams supported the presentation.

The quite exceptional feature of the lecture by which Herr Zecher has distinguished himself in a unique way is as follows: Interposed between the habitat shots again and again we saw tables of figures of pH values, the carbonate content of soil, humus proportions, trace elements, etc. From many habitats from which cacti were gathered he filled a pot with the soil in which they were growing and took it with him (this sounds easy but the soil must be borne along together with the cacti, often God knows how far!). The soil samples were investigated in a Vienna laboratory, and Herr Zecher has freely given the interesting results of the analyses to our bulletin for publication.

Results of the soil samples of factus habitats from material from the South American expedition of Rausch & Zecher 1970. Put at our disposal by Herr Ernst Zecher, Vienna.

Sample	pH (KCl)	% CaCO <sub>3</sub>	Ohm/m <sup>1</sup>	% Humus	mg in 100 gm soil				In ppm			
					N total	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	Mg <sup>++</sup>	Zn	Cu	Fe	Mn
P 1	6.45	0.0	2.208	9.39	5.7	42	30	41	32	6	520	265
P 2	6.2	5.4	4.692	1.30	2.2	36	17	40	6	7	100	208
P 3	5.9	0.0	3.036	1.84	1.8	23	12	36	9	4	440	295
P 5	7.0	0.0	6.210	12.13	4.2	12	30	38	55	11	680	283
P 7	6.3	0.0	3.174	6.38	5.8	14	17	37	68	5	590	306
P 8	7.0	0.0	4.968	0.87	1.8	23	30	35	0	2	50	87
P 9	3.75	0.0	10.488	5.59	3.4	16	12	34	1.5	2	470	145
P 10	5.4	0.0	9.936	1.6	1.2	5	15	35	1	13	230	36
P 11	7.0	0.0	1.145	0.0	1.4	49	15	33	1	3	160	57
A 1	6.6	0.0	19.320	0.39	1.3	16	10	26	3	3	40	30
A 2	6.85	0.0	7.314	0.73	1.2	16	20	28	4	4	70	66
A 3	7.2	3.4	1.048	0.38	1.0	30	5	34	4	4	40	95
A 4	7.15	0.0	8.000	0.57	1.1	30	22	26	5	5	30	92
B 1	5.2	0.0	11.316	2.14	2.5	12	25	25	4	5	80	90
B 2	4.55	0.0	6.348	2.42	4.0	8	17	27	4	5	65	114
B 4	6.4	6.1	1.186	0.3	1.2	13	8	34	3	3	20	135

P = Peru; A = Argentina; B = Bolivia.

- P 1 *Matucana haynei*. Type locality above the Ortes Matucana on the Lima - La Oroya road 2,500 to 2,800 m.
- P 2 *Espositoa melanostele* Above the Ortes Matucana on the Lima - La Oroya road at 2,500 to 2,800 m. Differs from P 1 through different rock formation.
- P 3 *Espositoa melanostele*  
*Melocactus peruvianus*  
*Haageocereus* (various)  
*Mila* (various)  
*Borzicactus tessellatus*  
*Armatocereus churinensis* Valley of the River Huaura (Churin Tal), dense cactus population, markedly dry valley 1,000 - 1,200 m; about 80 - 90 Km north of Lima.
- P 5 *Tephrocactus lagopus*  
*Lobivia oyonica* Same valley as P 3, only at 3,200 - 3,500 m, distinctly damper and cooler than at 1,200 m, beginning of the Puna high plateau.
- P 7 Oroya (in various forms and varieties)  
*Tephrocactus floccosus* From the main distribution area and the type locality between La Oroya and Tarma, 4000 m.
- P 8 *Morawetzia doelziana*  
*Azureocereus hertlingianus* Dry bowl near Ayacocho in the valley of the river Mantaro, 2,800 m.



P 9	Tephrocactus No.428 Tephrocactus rauhii	Typical high Puna plateau near Marcusari, at 4,450 m in Eastern Peru, Dept. Puno in the Eastern Cordilleras.
P 10	Lobivia mistiensi	Predominantly volcanic ash of the Misti volcano near Arequipa at 3,500 m.
P 11	Haageocereus decumbens Islaya (various)	Typical example of coastal desert with very low precipitation, near Atico 10 m above sea level, 700 Km south of Lima on the Pacific Ocean.
A 1	Parodia maasii Lobivia pugnionacantha Lobivia longispina Tephrocactus subterraneanus & others	Quite distinctive landscape of the Altiplano (high plateau) on the Bolivia-Argentine border, near La Quiaca at 3,500 m.
A 2	Mediolobivia einsteinii	Altiplano in the Chile-Argentine border region west of Abra Pampa at 4,000 m.
A 3	Lobivia rubescens	Alluvial terrace in the Quebrada de Humahuaca between Tilcara and Huacalera at 3,000 m.
A 4	Gymnocalycium asterium Tephrocactus papyracanthus	Near Milagro in the Province of La Rioja at 350 m (Salinas Grandes).
B 1	Lobivia pentlandii	Eucalyptos between La Paz and Oruro 3,800 to 4,000 m; profuse occurrence in all colours.
B 2	Lobivia pseudocinnabarina	Type locality near Coloni, east of Cochabamba at 2,500 m.
B 4	Lobivia lateritia Parodia roseoalbata	South Bolivia, Cinti; valley between Camargo and San Pedro on the road to Culpina.

The measurement of the pH values was done electrically - the free hydrogen ions were measured. The measurement of the electrical resistance (ohms/ml) was done at a ratio of 1:2, 50 gm of soil to 100 ml of distilled water. The figures for the trace elements in ppm (parts per million) is equivalent to mg per Kg of soil.

No ideal soil mixture should be or can be found from the soil samples given here: they should rather give an insight into soil compositions in the original habitat. In Europe we cannot reproduce such soil mixtures; in our collections the plants must grow - not starve.

From these samples certain things are clear:

1. The pH value: it is almost always in the acid range and rarely approaches neutrality.
2. Calcium carbonate: the cultivation hint recommending the addition of brick rubble to cactus composts is perhaps adequately contra-indicated.
3. The ratio of the principal nutrients (N:P:K) and the amount of certain trace elements.

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#### CHILEANS NATIONAL GATHERING - BROOKSBY '72

Our first National Gathering was attended by forty three members and was held at Brooksbury Agricultural College, in Leicestershire. Members came from as far afield as Cornwall, Scotland and Eire, and arrived on a wet and windy evening, which was followed immediately by an unseasonal cold snap. The litter of uncompleted reconstruction owing to the building worker's strike added a little more seasoning to the weekend.

There were so many plants brought as to be almost uncountable and these were placed in various

rooms, one to each group of genus, where the informal discussions were held. Microscopes enabled mounted seeds to be viewed with some genera and distribution maps accompanied two groups. There were also a vast number of slides brought along but only a selection could be viewed.

From P. Allcock we hear that "I found the weekend so enjoyable that I have little criticism to make, apart from the obvious one of the rather tight timetable we had. The formal lectures, which without exception were wholly excellent, would, I feel, have benefitted by being longer, more detailed, and with a little more time for discussion at the end. But of course one can only do so much in a weekend.

"The informal discussions clearly needed someone to take charge - in an informal way. I think it would be sufficient for someone in each group to start the discussion off and keep things moving. I do not think it either necessary or fair to sentence someone to look after every session on one group, as long as someone opened the proceedings. I can't see that it would matter whether or not this person knew anything about the genus under discussion, a question or request for information can always get things going.

"Finally, let me add that I for one can't wait for next year to roll round so that I can attend the next Chileans National Gathering. I am extremely grateful to all those people whose hard work made this year's Gathering so enjoyable."

Constructive criticism in a similar vein was received from many other members participating and this has been noted and will be acted upon.

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#### CHILEANS NATIONAL GATHERING - 1973

Our 1973 National Gathering will again be held at Brooksby College in Leicestershire, from Friday evening September 14th to mid-afternoon on Sunday September 16th. Subject to notification of charges from the Local Authority, it is expected that the cost will be £7.75 per head.

The programme will again consist of formal lectures and informal discussion sessions. Plants, slides, seeds, photographs and sketches will all be very welcome either for discussion or for identification. Informal discussion sessions will be led off by various members, amongst whom we hope to welcome Dr. E.W. Bentley (Copiapoa), A.W. Craig (Photography and Sulcorebutia), J. Forrest (Frailea), J. Hopkins (Lobivia), N.T. Hann (Trichocereus), D.J. Lewis (Copiapoa and Parodia), A.W. Mace (Notocacti), and G.J. Swales (Gymnocalycium).

Provisional bookings can now be accepted by the Course Secretary, Mr. J. Hobart, 39 Woodside, Darras Hall, Ponteland, Northumberland. Non-refundable deposit of £2 will be required by April 1st and balance by August 1st.

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#### FORTHCOMING ARTICLES

We should be pleased to hear from any member who has grown *Matucana fruticosa* on its own roots, or flowered this species; or who has raised *Zehntnerella* or *Leocereus* from seed or established an import; or successfully grown or flowered a *Calymmanthium*; or developed a thickened rootstock on any seed-grown *Weingartia*; or owns a fairly old or large *G. denudatum*; or has flowered or set fruit on any *Haageocereus*; or has established either *Weingartia Lau 905* or *916*.

Information on the source of seed *Gymno. sp. nov. Rio Negro* distributed by The Chileans 1968/9 would be welcome.

HOW TALL IS A CACTUS from G.J.Swales.

For some time now, my blood pressure has been elevated at frequent intervals by reading in the cactus literature (Chileans included!) of such and such a plant being "300 mm high" or another being "100 mm in diameter". Whilst not campaigning for the return of non-metric units, I really must insist that using the millimeter as a unit in such circumstances is ridiculous. Nobody, however practiced in the use of the metric system, can envisage what is meant by such a measurement without mentally removing a nought and converting to centimetres. An astronomer does not measure his distances in milli- or even kilometers but uses light-years, a unit appropriate to the vast distances involved. We too, should use units appropriate to the scale of the objects being measured and I am therefore suggesting a return to the centimeter and sanity.

The reason for this units temporary (I hope) disappearance is the introduction of a universal system of units, the Systeme Internationale (S.I. for short) which involves all basic units used in science, and which it is intended shall be used throughout the world. Length in S.I. units is based on millimeters, meters and kilometers plus some smaller units which need not concern us here. Thus it would appear at first glance, that the centimeter has disappeared completely. However, nowhere has it been stated by the responsible organisations that decimal multiples and fractions of the so-called "coherent S.I. units" cannot still be used. In fact, it has been admitted that it would be quite impracticable to restrict the use of units in that way in circumstances such as those under discussion. So please, with a perfectly clear conscience, let us go back to our centimeters where appropriate, and reserve our millimeters for measuring areoles, anther lobes and similar minutiae.

A fitting conclusion, I feel, is provided by Professor E.R.Laithwaite, of Imperial College, London, who - addressing a meeting of the Association for Science Education recently - reminded his audience "The convenience of mankind, never let us forget this first rule in our science ..... units were made for our convenience, not for the sake of conformity."

What more need I say?

Comments from H Middleditch.

"I must admit to having suffered from bouts of schizophrenia when preparing articles for the Chileans, over dimensions quoted in metric units. There appeared to be an accepted standard of millimeters which we should really conform to, but these conveyed nothing to me unless I mentally converted them into centimeters (except for quantities under 10 mm). I find that I can picture a centimeter dimension in my mind's eye without difficulty and I would much prefer to see this unit retained and used in our hobby. I really see no point in persisting with millimeters for larger dimensions if most of our readers find centimeters more convenient. If the rest of the world wishes to operate on millimeters then I for one am quite happy to let them do so. I think from now on we shall use only the units that can be readily understood."

..... from G.E.H. Bailey.

"The S.I. is fearfully clever, involving not only the use of the millimetre, metre, and kilometer as the units of length but also all the various pico, nano, micro, etc. sub-divisions at the other end, each step being a thousand times that of the one before. The fact that the millimetre is too small and the metre too large for many purposes does not concern the Great Brains who instigated this wonderful scheme, which is also going to involve a new approach to the way we write numbers, thus 1,000,000.001 will be written 1 000 000,001. (That is probably to keep on the right side of M. Pompidou, who has always used a comma in place of the decimal point). However, there is nothing to stop us using centimetres if we so wish and in any case, if others persist in using the millimetre, we can remember that there are roughly 25 of them to the old-fashioned inch. In other spheres, we find these systematic units somewhat awkward, the Farad being much too big and the Ohm a bit on the small side.

..... from R. Ginns.

"When scientists, politicians etc. want an expensive holiday at someone else's expense, they arrange an international conference. Naturally, they are expected to get some results so they make recommendations scrapping previous ideas. Hence the Systeme Internationale. The fact that all previous scientific units - heat, electricity, energy etc., - were based on the centimetre, gramme, second (c.g.s.) seems to have been ignored. Are volts, calories, ergs etc also being scrapped along with the centimetre?"

"I am thoroughly in agreement with previous contributors that we should continue to use centimetres for general use, reserving mms for parts of the plant less than 1 cm in magnitude.

"The centimeter is large enough to be visualized. Thus I can look at a plant and say that it is 5 cms in diameter approximately, without carrying a pair of dividers or calipers and a ruler with me. The mm is too small to be used in this way. We cannot distinguish visually between 4 and 6 mm. So by all means let us stick to the units we know. Of course we can convert cms to mms by adding a 0 but why complicate a very simple matter?"

"A young salesman trying to sell me a new gas-stove annoyed me by saying that everything new was an improvement on anything old. How many modern cars from the production lines will have a life as long as the vintage cars that are still roadworthy? Too many people concerned with our hobby, particularly taxonomists, have the same ideas as this salesman."

..... from A.J.S.McMillan.

"I must take responsibility for the application of S.I. principles to measurements given in 'The Chileans'. However, I hold no strong brief for the Systeme Internationale (feeling that Mr.Ginn is, in essence, correct in his suggestions about its origin), and am quite happy to revert to centimeters as suggested by Mr.Swales and others.

"In fact, I would go farther, in thorough sympathy with Prof. Laithwaite's contention that units are made for our convenience, and suggest that feet and inches are and will always remain far more convenient and easily visualised units than anything in the metric system".

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#### MORE FR. NUMBERS

Since the publication of our 1972 Year Book, the following numbers have appeared in the Austrian Cactus Society Journal:-

1351	<i>Brasiliopuntia</i> sp.
1352	<i>Coleocephalocereus paulensis</i>
1354	<i>Arthrocareus</i> sp.
1355	<i>Arthrocareus</i> sp.
1356	<i>Melocactus</i> sp.
1357	<i>Melocactus</i> sp.
1358	<i>Melocactus</i> sp.
1359	<i>Pilosocereus</i> sp.
1360	<i>Pilosocereus</i> sp.
1362	<i>Frailea phaeodisca</i>
1363	<i>Frailea asterioides</i> v. <i>harmoniana</i>
1363a	<i>Frailea asterioides</i> v. <i>backebergii</i>
1364	<i>Frailea pumila</i>
1363b	<i>Frailea asterioides</i> v. <i>major</i>
1367	<i>Frailea pumila</i> var.
1369	<i>Frailea pygmaea</i> v. <i>longispina</i>

1370	<i>Frailea pygmaea</i> v. <i>major</i>
1371	<i>Frailea pygmaea</i> v. <i>curvispina</i>
1372	<i>Gymnocalycium denudatum</i>
1373	<i>Gymnocalycium</i> sp.
1374	<i>Gymnocalycium uruguayense</i>
1378	<i>Notocactus glaucinus</i> v. <i>gracilis</i>
1379	<i>Notocactus fuscus</i>
1383	<i>Echinopsis brasiliensis</i>
1390	<i>Notocactus eremiticus</i>
1396	<i>Notocactus arechavaletai</i> v. <i>aureus</i>
1397	<i>Notocactus</i> sp.
1398	<i>Notocactus</i> sp.
1400	<i>Eriocactus</i> sp.
1404	<i>Echinopsis eyriesii</i>
1405	<i>Rhipsalis grandiflora</i> var.
1406	<i>Melocactus melocactiformis</i>
1407	<i>Opuntia</i> sp.
1408	<i>Opuntia</i> sp.
1409	<i>Monvillea</i> sp.
1410	<i>Cereus</i> sp.
1411	<i>Cereus</i> sp.
1412	<i>Cereus</i> sp.
1413	<i>Peireskia</i> sp.
1414	<i>Notocactus</i> sp.
1415	<i>Notocactus arechavaletai</i> v. <i>limiticola</i>
1416	<i>Coleocephalocereus</i> sp.
1417	<i>Opuntia</i> sp.
1418	<i>Opuntia</i> sp.
1419	<i>Epiphyllum</i> sp.
1420	<i>Cereus</i> sp.
1421	<i>Cereus</i> sp.
1422	<i>Opuntia</i> sp.
1425	<i>Chileorebutia nuda</i>
1426	<i>Notocactus glaucinus</i> v. <i>gracilis</i> = FR 1378
1427	<i>Wigginsia comantii</i>
1432	<i>Pyrrhocactus transiens</i>
1439	<i>Pyrrhocactus coliquagnensis</i>
1443	<i>Copiapoa olivarna</i>
1447	<i>Copiapoa variispinata</i>
1450	<i>Pyrrhocactus neokrausii</i>
1452	<i>Copiapoa rarissima</i>
1453	<i>Pyrrhocactus tenuis</i>
1457	<i>Copiapoa esmeraldana</i>
1461	<i>Copiapoa wagenknechtii</i> var. <i>armata</i>
1462	<i>Islaya minuscula</i>
1466	<i>Echinopsis ancistrophora</i>
1471	<i>Bolivocereus chroceus</i>

## STUDY GROUPS / ROUND ROBINS

Cleistocacti	T.Lavender, 62 Finchale Avenue, Billingham, Teesside TS23 2EB.
Copiapoa	D.J.Lewis, 80 Pencisley Road, Llandaff, Cardiff CF5 1DQ.
Epiphytes	A.J.S.McMillan, 5 Oakfield Road, Bristol BS8 2AJ.
Freilea	J.Forrest, Beechfield House, Meikle Earnock Road, Hamilton, Scotland.
Gymnocalycium	G.J.Swales, 5 Hillcrest, Middle Herrington, Sunderland, Co. Durham.
Lobivia	J.Hopkins, 25 Crossefield Road, Cheadle Hulme, Cheadle, Cheshire SK8 5PD.
Matucana/Borzicactinae	W.W.Atkinson, 12 Court Road, Tunbridge Wells, Kent.
Mediolobivia	J.R.Chapman, 5 The Crescent, Raunceby Hospital, Sleaford, Lincs.
Melocactus/Discocactus	Mrs.L.Teare, 7 Birkinshaw Avenue, Trammere, Adelaide, South Australia 5073, Australia.
Neoporteriae	D.Rushforth, 80 Cheltenham Road, Gloucester GL2 0LX.
Notocactinae	K.H.Halstead, Little Firtrees, Wellington Close, Dibden Purlieu, Southampton.
Parodia	A.Johnston, 11 Malvern Road, Scunthorpe, Lincs.
Photographing Cacti	A.W.Craig, Davela, Forest Lane, Kirk Levington, Nr.Yarm, Yorks.
Sulcorebutia	W.G.Sykes, 10 Ashley Close, Thornton Cleveleys, Lancs FY5 5EG.
Trichocereus	N.T.Hann, 5 Lake Road, Shirley, Croydon, Surrey CR0 8DS.

## THE CHILEANS

Organiser	H.Middleditch, 5 Lyons Avenue, Hetton le Hole, Co.Durham, England DH5 0HS.
Editor	A.J.S.McMillan, 5 Oakfield Road, Bristol BS8 2AJ.
Treasurer	R.L.Purves, 19 Brocks Drive, Fairlands, Guildford, Surrey.
Membership Secretary and Back Numbers	Mrs A.Lavender, 62 Finchale Avenue, Billingham, Teesside TS23 2EB.
Seed Exchange	J.Hopkins, 25 Crossefield Road, Cheadle Hulme, Cheadle, Cheshire SK8 5PD.
Slide Librarian	A.W.Craig, Davela, Forest Lane, Kirk Levington, Nr.Yarm, Yorks.

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