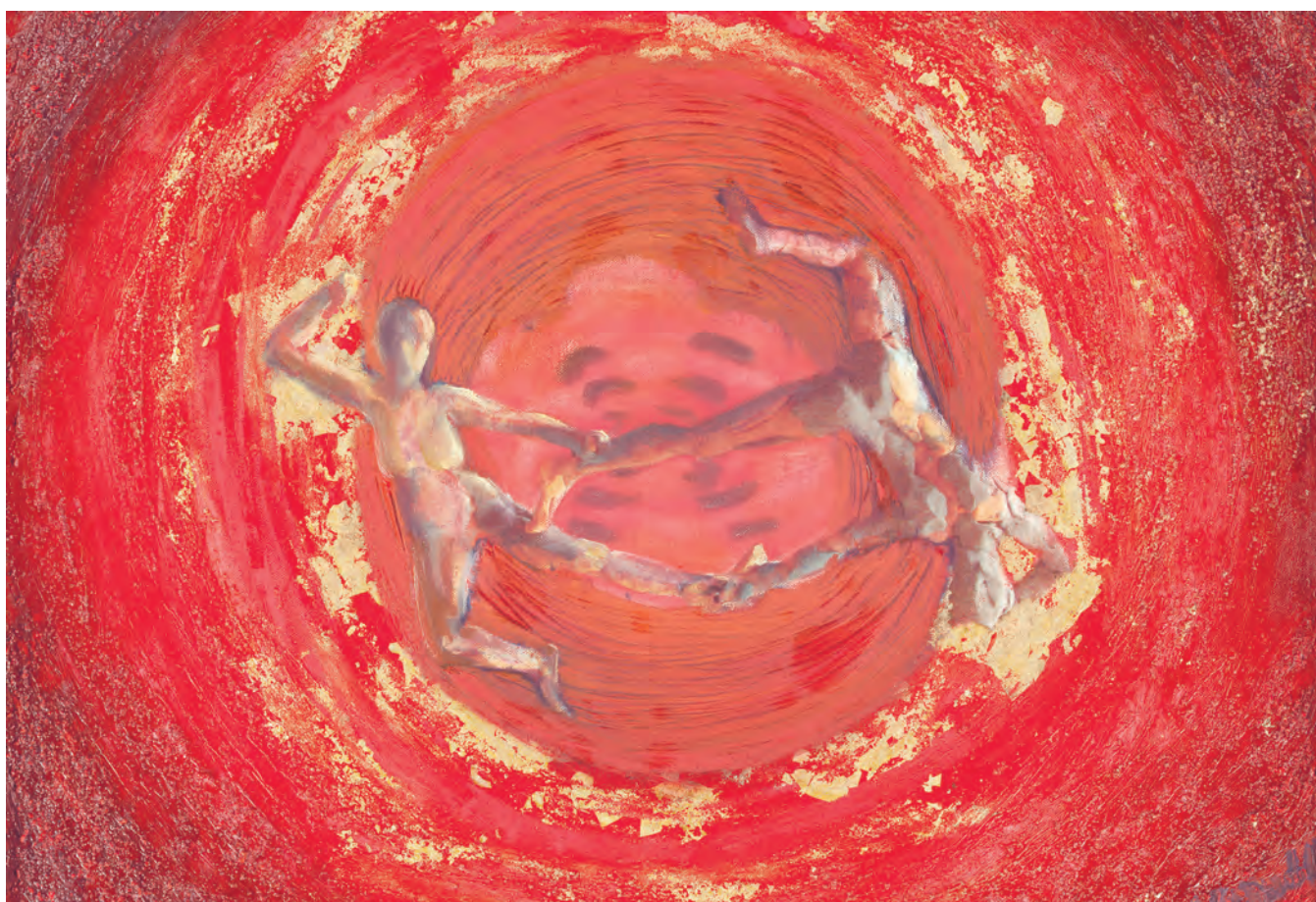


**PROCEEDINGS of the
AMERICAN ASSOCIATION for the ADVANCEMENT of SCIENCE
PACIFIC DIVISION**

Volume 29, Part I

13 June 2010

**91st ANNUAL MEETING
PROGRAM with ABSTRACTS**
including the 2010 update to the
BRIEF HISTORY of the PACIFIC DIVISION

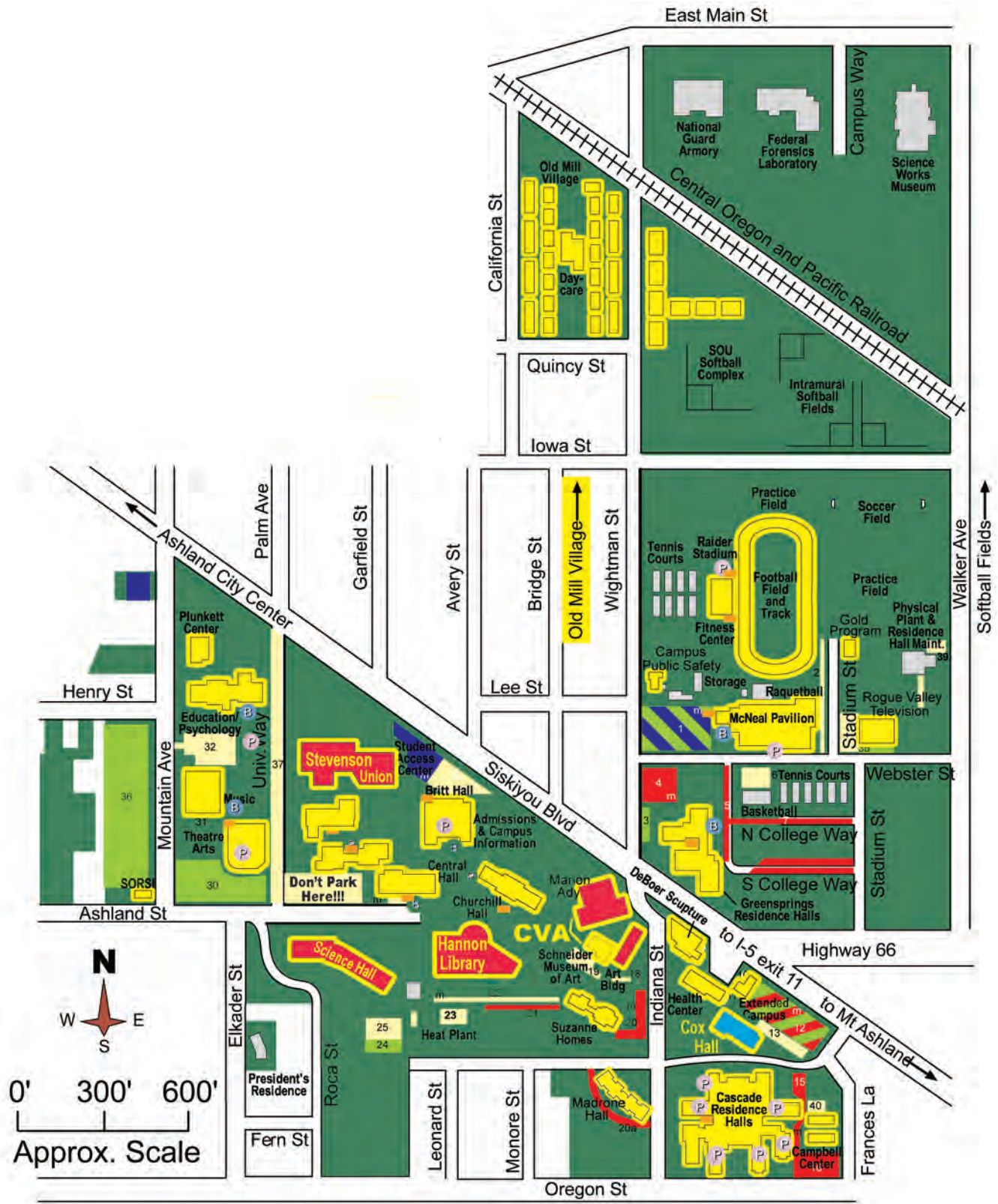


**SOUTHERN OREGON UNIVERSITY
ASHLAND, OR
13 – 17 June 2010**

**SO | Southern OREGON
UNIVERSITY**

SCHNEIDER
MUSEUM
OF
ART

 **AAAS**
ADVANCING SCIENCE, SERVING SOCIETY



Map of Southern Oregon University campus. Parking is in lot #30, colored light green. Buildings in which the meeting will take place are colored red with yellow outlines. Cox Hall (campus housing) is colored blue with a yellow outline.

PROCEEDINGS
of the
Annual Meeting
of the
AAAS, PACIFIC DIVISION

Volume 29, Part I

13 June 2010

PROGRAM with ABSTRACTS
including the 2010 update to the
BRIEF HISTORY of the PACIFIC DIVISION

**91st Annual Meeting of the Pacific Division of the
American Association for the Advancement of Science**

Southern Oregon University
Ashland, OR
13 – 17 June 2010

Contents accurate as of 26 May 2010.
Times and/or locations of events may change.
Please refer to the “Changes” flyer for updated information.



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Pacific Division

AAAS

**THE PACIFIC DIVISION OF THE
AMERICAN ASSOCIATION FOR THE
ADVANCEMENT OF SCIENCE**

**A BRIEF HISTORY, MEETING SITES, PRESIDENTS
AND OTHER OFFICERS, PUBLICATIONS, AND A
PORTRAIT GALLERY OF ITS OFFICERS
(1912–2010)**

Third Edition

**Michele L. Aldrich
Alan E. Leviton
Robert I. Bowman†**

Ashland, Oregon
2010

NOTE TO THE FIRST EDITION

This booklet owes its existence to the initial effort by Dr. Robert Bowman (1925–2006) who, in 1987, assembled the portraits of the past presidents of the Pacific Division AAAS for a showcase display in the Library at San Francisco State University during the Division's annual meeting in June of that year. The portraits and a brief history of the Division were then published in 1994 in the *Proceedings* of the Pacific Division AAAS (vol. 13, pt. 1, 8 pp. [unnumbered]), which also contained the program with abstracts of the Division's 1994 annual meeting, again held at San Francisco State University, June 19–24.

It was decided to update the portrait file with the addition of images of Division presidents serving to the end of the 20th century, in several cases to substitute new images for those that were used before, and to supplement the 1994 materials with additional information about the Division and its officers.

The Division has deposited its archival records for the period 1910–1998, including the portrait collection of its presidents, with the Bancroft Library, University of California, Berkeley, California.* For those interested in learning more about this collection and the part played by the Division in fostering cooperation and communication about science among scientists, students, and the public in the Pacific Region, visit the Bancroft Library's website.

[*N.B. The archive was updated in 2001 with the addition of records for the period 1999–2001, and periodically additional records will be sent to Bancroft.]

Notes for the Second and Third editions

Second Edition (2002): Additional portraits that have been added since the original publication have been provided courtesy the Archives and Special Collections of the California Academy of Sciences and the GS Myers/AE Leviton Biographical & Portrait File in the Natural Sciences, also at the California Academy of Sciences.

Third Edition (2010): Additional portraits have been added since the original publication and that of the Second Edition. Most of these have been provided by Alan E. Leviton. The originals are now in the GS Myers/AE Leviton Biographical & Portrait File in the Natural Sciences, also at the California Academy of Sciences. In addition, meetings and officer lists have been updated to 2010 and errors that had escaped detection in earlier additions have been corrected. At this time, the authors also want to thank both Roger and Angie Christianson for their careful perusal of the manuscript and for bringing to their attention items that needed to be corrected or modified.

First printed edition 1999
Second printed edition 2002
Revised and enlarged
Third printed edition 2010
Revised and enlarged
First electronic edition 2001
Second electronic edition 2002
Third electronic edition 2010

PACIFIC DIVISION OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE A BRIEF HISTORY

In 1910, a group of West Coast scientific societies came together to form the Pacific Association of Scientific Societies (PASS). Twenty-one organizations, mostly regional sections of national societies, became affiliates of this fledgling umbrella organization. In late 1912, in preparation for the 1915 annual meeting of the American Association for the Advancement of Science (AAAS), scheduled to be held in San Francisco, AAAS established the Pacific Coast Committee of AAAS to handle logistics and program planning. In late December of that year, the Council of AAAS decided to recognize the committee as the Pacific Division of AAAS and on 21 April 1914 it voted to amend the AAAS Constitution to accommodate the change and ratify the Division's new Constitution. Within months, the Pacific Association of Scientific Societies, its membership overlapping that of the Pacific Division AAAS, proposed that it merge with the Division. During the next 12 months, most of the PASS affiliates ratified the new arrangement. Among them were the Cordilleran Section of the Geological Society of America, Pacific Coast Section of the Paleontological Society, Seismological Society of America, California Academy of Sciences, Pacific Slope Association of Economic Entomologists, Astronomical Society of the Pacific Coast, Cooper Ornithological Club, Northern and Southern Divisions, California and Puget Sound Sections of the American Chemical Society, San Francisco Section of the Archaeological Institute of America, San Francisco Section of the American Mathematical Society, San Diego Society of Natural History, and the Western Society of Naturalists.

Initially, the Division's region included the states of Washington, Oregon, California, Idaho, Nevada, Utah, and Arizona, the territory of Alaska, the Canadian Province of British Columbia, and the Hawaiian Islands. The original intent had been to include the Philippine Islands as well as all other islands in the Pacific Basin, and Mexico, but these intentions were not to be fulfilled for many years, and then only partially so.

With the establishment of the Southwest and Rocky Mountain Division (SWARM) in 1920, Arizona was transferred from the Pacific to the SWARM Division, and, in 1951, following the first Alaska Science Conference held the previous year, Alaska and the two boreal/Arctic territories of Canada, Yukon and Northwest Territories, formed the Alaskan Division, renamed the Arctic Division in 1982. In 1993, the Council of AAAS, having approved the addition of the Canadian Province of Alberta to the Pacific Division's region in 1983, and in recognition of the Association's expanding international interests, at the Division's request, allowed that all countries bordering or lying within the Pacific Basin, save those countries that had already been assigned to other Divisions of the Association, should be brought into the Pacific Division's fold, thus fulfilling the original intentions of the Division's founders nearly 80 years earlier.

In the years since its founding, the Pacific Division of AAAS, the senior of the four Divisions of AAAS, a Caribbean Division having been authorized in 1985, has held annual meetings every year save during the First and Second World Wars. It has sponsored a publications

program, its first book having been published in 1915, and then, following a hiatus of many decades, its second through 20th between 1979 and 2005.

In 1915, the Division met for the first time jointly with its new parent when national AAAS held its first-ever annual meeting in San Francisco as part of the Pan American Exposition activities of that year. The following year, it held its first independent meeting, in San Diego. Since then, the Division has held meetings annually, nearly always on university campuses throughout the Far West, where it has enjoyed the hospitality of many of the nation's ranking institutions of higher learning. The Division's meetings, though designed to provide a forum for the discussion of scientific problems of regional concern, are not constrained to regional issues, and more often than not they promote symposia and other paper sessions that take on issues of far wider import, many global in scope. In addition, from the beginning, the Division has been sensitive to the needs of students, and to this day it offers them a unique opportunity to participate in highly professional programs where seasoned professionals and novices meet one another in a relaxed yet challenging environment. Furthermore, in 2007, The Division inaugurated a student research awards program with funds received from earmarked donations by Division members.

The Division's success over the years is perhaps best exemplified by the many distinguished scientists who have given freely of their time and energies in its behalf. They have served as officers, chaired committees, organized sessions, indeed, even the meetings themselves, have presented papers, and, last but not least, have encouraged their students to do the same. The list of Division Presidents is a who's who of distinguished scientists, past and present, and includes, for example, John C. Merriam, John C. Branner, Harald U. Sverdrup, Arthur H. Sturtevant, Melvin Calvin, Garrett Hardin, Linus Pauling, Richard Walker, Mildred Mathias, Richard Jahns, Emanuel Epstein, Dael Wolffe, Estella Leopold, Luna Leopold, J. Thomas Dutro, Jr., and Garniss Curtis, to name a few of the many whose portraits are to be found on the following pages.

The accomplishments of the Pacific Division AAAS are the result of many factors, the people who help organize its meetings, those who participate through the presentation of papers, the elected officers and members of its committees, its tolerance of controversial programs where balance insures that both popular and unpopular views may be laid upon the table for open discussion and criticism, its publications, and, not the least, the support given by the national AAAS, its Executive Officer, its Board of Directors, and its staff.

Lastly, we take note that the Division is quickly closing in on a milestone, the 100th anniversary of its founding in December of 1912!

Michele L. Aldrich
Alan E. Leviton
Robert I. Bowman†
15 February 2010

† Our colleague and coauthor, Robert Bowman, passed away on 12 March 2006, in his 80th year.

**LOCATION AND YEAR OF ANNUAL MEETINGS OF THE
PACIFIC DIVISION AAAS
1915–2010**

1915	San Francisco, CA [with AAAS] (2–7 Aug.)	1964	Vancouver, BC (22–27 June)
1916	San Diego, CA (9–12 August)	1965	Riverside, CA (21–26 June)
1917	Stanford, CA (4–7 April)	1966	Seattle, WA (13–18 June)
1918	WORLD WAR I: NO MEETING	1967	Los Angeles, CA (19–24 June)
1919	Pasadena, CA (19–22 June)	1968	Logan, UT (24–29 June)
1920	Seattle, WA (17–19 June)	1969	Pullman, WA (18–23 August)
1921	Berkeley, CA (4–6 August)	1970	Berkeley, CA (21–25 June)
1922	Salt Lake City, UT (22–24 June)	1971	San Diego, CA (21–25 June)
1923	Los Angeles, CA [with AAAS] (17–20 Sep.)	1972	Eugene, OR (11–17 June)
1924	Stanford, CA (25–28 June)	1973	Salt Lake City, UT (11–15 June)
1925	Portland, OR (17–20 June)	1974	Irvine, CA (17–21 June)
1926	Oakland, CA (16–19 June)	1975	Corvallis, OR [with AIBS] (17–22 August)
1927	Reno, NV (22–24 June)	1976	Missoula, MT (14–17 June)
1928	Claremont, CA (13–16 June)	1977	San Francisco, CA (12–16 June)
1929	Berkeley, CA (19–22 June)	1978	Seattle, WA (13–17 June)
1930	Eugene, OR (18–21 June)	1979	Moscow, ID (3–7 June)
1931	Pasadena, CA [with AAAS] (15–20 June)	1980	Davis, CA (22–27 June)
1932	Pullman, WA (15–18 June)	1981	Eugene, OR (14–19 June)
1933	Salt Lake City, UT (12–15 June)	1982	Santa Barbara, CA (20–25 June)
1934	Berkeley, CA [with AAAS] (18–23 June)	1983	Logan, UT (19–24 June)
1935	Los Angeles, CA (25–29 June)	1984	San Francisco, CA (10–15 June)
1936	Seattle, WA (16–20 June)	1985	Missoula, MT (9–14 June)
1937	Denver, CO [with AAAS] (21–26 June)	1986	Vancouver, BC (8–13 June)
1938	San Diego, CA (20–25 June)	1987	San Diego, CA (14–18 June)
1939	Stanford, CA (26 June–1 July)	1988	Corvallis, OR (18–22 June)
1940	Seattle, WA [with AAAS] (17–22 June)	1989	Chico, CA (11–15 June)
1941	Pasadena, CA (16–21 June)	1990	Davis, CA (19–23 June)
1942	Salt Lake City, UT (15–20 June)	1991	Logan, UT (23–27 June)
1943–1945	WORLD WAR II: NO MEETINGS	1992	Santa Barbara, CA (21–25 June)
1946	Reno, NV (17–22 June)	1993	Missoula, MT (20–24 June)
1947	San Diego, CA (16–21 June)	1994	San Francisco, CA (19–23 June)
1948	Berkeley, CA (21–26 June)	1995	Vancouver, BC (18–22 June)
1949	Vancouver, BC (13–18 June)	1996	San Jose, CA (23–27 June)
1950	Salt Lake City, UT (19–24 June)	1997	Corvallis, OR (22–25 June)
1951	Los Angeles, CA (18–23 June)	1998	Logan, UT (28 June–2 July)
1952	Corvallis, OR (16–21 June)	1999	San Francisco, CA (19–23 June)
1953	Santa Barbara, CA (15–20 June)	2000	Ashland, OR (11–14 June)
1954	Pullman, WA (21–26 June)	2001	Irvine, CA (17–20 June)
1955	Pasadena, CA (20–25 June)	2002	Waimea, HI (12–16 June)
1956	Seattle, WA (11–16 June)	2003	San Francisco, CA (15–19 June)
1957	Stanford, CA [with AIBS] (25–29 August)	2004	Logan, UT (13–17 June)
1958	Logan, UT (16–20 June)	2005	Ashland, OR (12–16 June)
1959	San Diego, CA (15–19 June)	2006	San Diego, CA (18–22 June)
1960	Eugene, OR (13–18 June)	2007	Boise, ID (17–21 June)
1961	Davis, CA (19–23 June)	2008	Waimea, HI (15–20 June)
1962	Corvallis, OR (26–31 August)	2009	San Francisco, CA (14–20 August)
1963	Stanford, CA (17–21 June)	2010	Ashland, OR (13–17 June)

**PACIFIC DIVISION AAAS
PAST PRESIDENTS, THEIR INSTITUTIONS, AND THEIR FIELDS
1916–2010**

1916 William Wallace Campbell	Astronomy	1943–1945	No officers elected during World War II
Lick Observatory, University of California, Mount Hamilton, California		1946 Linus Carl Pauling	Chemistry
1917 John Casper Branner	Geology	California Institute of Technology, Pasadena, California	
Stanford University, Palo Alto, California		1947 Thomas Gordon Thompson	Oceanography
1918	No officers elected during World War I	University of Washington, Seattle, Washington	
1919 Daniel Trembly MacDougal	Botany	1948 Roy Elwood Clausen	Agriculture/Genetics
Desert Botanical Laboratory, Carnegie Institution of Washington, Tucson, Arizona		University of California, Berkeley, California	
1920 John Campbell Merriam	Paleontology/Geology	1949 Luther Sheeleigh Cressman	Anthropology
University of California, Berkeley, California		University of Oregon, Eugene, Oregon	
1921 William Emerson Ritter	Zoology	1950 Laurence Monroe Klauber	Herpetology/Statistics
Scripps Institution of Oceanography, La Jolla, California		San Diego Society of Natural History; CEO, San Diego Power & Light, San Diego, California	
1922 Barton Warren Evermann	Ichthyology	1951 Charles Haskell Danforth	Anatomy/Zoology
California Academy of Sciences, San Francisco, California		Stanford University, Stanford, California	
1923 Exum Percival Lewis	Physics	1952 Herman Augustus Spoehr	Plant Physiology
University of California, Berkeley, California		Carnegie Institution of Washington, Stanford, California	
1924 David Starr Jordan	Ichthyology	1953 Charles Donald Shane	Astronomy
Stanford University, Palo Alto, California		Lick Observatory, University of California, Mount Hamilton, California	
1925 Carl Ewald Grunsky	Engineering	1954 Alfred Henry Sturtevant	Genetics
Consulting Engineer and California Academy of Sciences, San Francisco, California		California Institute of Technology, Pasadena, California	
1926 Robert Grant Aitkin	Astronomy	1955 E. R. Guthrie	Psychology
Lick Observatory, University of California, Mount Hamilton, California		University of California, Riverside, California	
1927 Arthur Amos Noyes	Chemistry	1956 Robert Bigham Brode	Physics
California Institute of Technology, Pasadena, California		University of California, Berkeley, California	
1928 Charles Atwood Kofoid	Zoology	1957 James Murray Luck	Biochemistry
University of California, Berkeley, California		Stanford University, Stanford, California	
1929 Walter Sydney Adams	Astronomy	1958 Ian Campbell	Geology
Mount Wilson Observatory, Pasadena, California		California Institute of Technology, Pasadena, California	
1930 Douglas Houghton Campbell	Botany	1959 Henry Eyring	Physical Chemistry
Stanford University, Palo Alto, California		University of Utah, Salt Lake City, Utah	
1931 Thomas Wayland Vaughan	Oceanography	1960 Henry Paul Hansen	Palynology/Paleoecology
Scripps Institution of Oceanography, La Jolla, California		Oregon State University, Corvallis, Oregon	
1932 Armin Otto Leuschner	Astronomy	1961 William Amie Clemens	Zoology
University of California, Berkeley, California		University of British Columbia, Vancouver, British Columbia	
1933 William Frederick Durand	Mechanical Engineering	1962 Melvin Calvin	Organic Chemistry
Stanford University, Palo Alto, California		University of California, Berkeley, California	
1934 Joel Henry Hildebrand	Chemistry	1963 John Patrick Tully	Oceanography
University of California, Berkeley, California		Pacific Oceanographic Group, Nanaimo, British Columbia	
1935 Bailey Willis	Geology	1964 Phil Edwards Church	Meteorology
Stanford University, Palo Alto, California		University of Washington, Seattle, Washington	
1936/1937 Richard Chace Tolman	Physical Chemistry	1965 James Fredrick Bonner	Plant Physiology
California Institute of Technology, Pasadena, California		California Institute of Technology, Pasadena, California	
1938 John Stanley Plaskett	Astrophysics	1966 Daniel Gaskill Aldrich, Jr.	Agronomy
Dominion Astrophysical Observatory, Victoria, British Columbia		University of California, Irvine, California	
1939 Samuel Jackson Holmes	Animal Behavior/Genetics	1967 Adolph Hecht	Botany
University of California, Berkeley, California		Washington State University, Pullman, Washington	
1940 Lewis Madison Terman	Psychology	1968 Garrett Hardin	Biology
Stanford University, Palo Alto, California		University of California, Santa Barbara, California	
1941 Harald Ulrik Sverdrup	Oceanography	6/68–6/69 William Cowperthwaite Snyder	Plant Pathology
Scripps Institution of Oceanography, La Jolla, California		University of California, Berkeley, California	
1942 Dennis Robert Hoagland	Soil Science	6/69–6/70 Theodore Louis Jahn	Zoology
University of California, Berkeley, California		University of California, Los Angeles, California	
		6/70–6/71 George Edmund Lindsay	Botany
		California Academy of Sciences, San Francisco, California	

BRIEF HISTORY of the PACIFIC DIVISION

6

6/71–6/72 Roy Alton Young	Plant Pathology Oregon State University, Corvallis, Oregon	6/90–6/91 Emanuel Epstein	Plant Physiology University of California, Davis, California
6/72–6/73 John Dove Isaacs	Oceanography Scripps Institution of Oceanography, La Jolla, California	6/91–6/92 Dael Wolfe	Psychology/Public Affairs University of Washington, Seattle, Washington
6/73–6/74 Robert Cunningham Miller	Zoology California Academy of Sciences, San Francisco, California	6/92–6/93 William Campbell	Horticulture Utah State University, Logan, Utah
6/74–6/75 George Aubrey Zentmyer, Jr.	Plant Pathology University of Washington, Seattle, Washington	6/93–6/94 David Stoddart	Geography/Ecology University of California, Berkeley, California
6/75–6/76 Richard Battson Walker	Botany University of Washington, Seattle, Washington	6/94–6/95 Estella Bergere Leopold	Botany/Palynology University of Washington, Seattle, Washington
6/76–6/77 Robert Thomas Orr	Birds/Mammals California Academy of Sciences, San Francisco, California	6/95–6/96 Orman Granger	Meteorology University of California, Berkeley, California
6/77–6/78 Mildred Esther Mathias	Botany University of California, Los Angeles, California	6/96–6/97 John Thomas Dutro, Jr.	Geology/Paleontology US Geological Survey, Washington, DC
6/78–6/79 Glenn C. Lewis	Soil Science University of Idaho, Moscow, Idaho	6/97–6/98 Luna Bergere Leopold	Geology University of California, Berkeley, California
6/79–6/80 William Lynn Sims	Horticulture University of California, Davis, California	6/98–6/99 Alan Edward Leviton	Herpetology/Biogeography California Academy of Sciences, San Francisco, California
6/80–6/81 Beatrice Marcy Sweeney	Plant Physiology University of California, Santa Barbara, California	6/99–6/00 Rita Whitmore Peterson	Education University of California, Irvine, California
6/81–6/82 Robert Irwin Bowman	Vertebrate Zoology San Francisco State University, San Francisco, California	6/00–6/01 Garniss Curtis	Geology/Geochronology University of California, Berkeley, California
6/82–6/83 Herbert George Baker	Botany University of California, Berkeley, California	6/01–6/02 Nina Grace Jablonski	Anthropology California Academy of Sciences, San Francisco, California
[6/83–6/84] Richard Henry Jahns	Geology (President-Elect; died in office); Stanford University, Stanford, California	6/02–6/03 John J. Carroll	Atmospheric Sciences University of California, Davis, California
6/83–6/84 Barbara Evelyn Wright	Biochemistry University of Montana, Missoula, Montana	6/03–6/04 William B. N. Berry	Paleobiology University of California, Berkeley, California
6/84–6/85 Walter Hale Gardner	Soil Science Washington State University, Pullman, Washington	6/04–6/05 Lynn Dudley	Soil Sciences Utah State University, Logan, Utah
6/85–6/86 Geoffrey George Edgar Scudder	Entomology University of British Columbia, Vancouver, British Columbia	6/05–6/06 Kathleen M. Fisher	Biology/Education San Diego State University, San Diego, California
6/86–6/87 T. John Conomos	Water Resources US Geological Survey, Menlo Park, California	6/06–6/07 Carl Maida	Anthropology University of California, Los Angeles, California
6/87–6/88 Orrin Ernest Smith	Horticulture Oregon State University, Corvallis, Oregon	6/07–6/08 Terrence M. Gosliner	Invertebrate Zoology California Academy of Sciences, San Francisco, California
6/88–6/89 James William Valentine	Paleobiology University of California, Santa Barbara, California	6/08–8/09 Anne A. Sturz	Marine Oceanography University of San Diego, San Diego, California
6/89–6/90 Frederic N. Nichols	Water Resources US Geological Survey, Menlo Park, California	8/09–6/10 John Hafernik	Biology San Francisco State University, San Francisco, California

**SCIENTIFIC PUBLICATIONS OF THE PACIFIC DIVISION AAAS
1915–2005**

(Exclusive of Newsletters, Meetings Announcements, and *Proceedings* volumes containing the Programs with Abstracts)

BOOKS

(Unless otherwise indicated, the following books were published by the Pacific Division AAAS)

- 1915 Pacific Coast Committee (Division), AAAS. *Nature and Science on the Pacific Coast*. xii + 302 pp., 29 pls., 2 foldout maps. (Published by Paul Elder & Co., San Francisco, California.)
- 1979 Conomos, T. John, ed. *San Francisco Bay: The Urbanized Estuary*. 493 pp.
- 1980 Taylor, Ronald J., and Alan E. Leviton, eds. [*Biology of*] *The Mosses of North America*. 170 pp.
- 1982 Kockelman, William J., T. John Conomos, and Alan E. Leviton, eds. *San Francisco Bay: Use and Protection*. 309 pp.
- 1982 Leviton, Alan E., Peter U. Rodda, Ellis L. Yochelson, and Michele L. Aldrich, eds. *Frontiers of Geological Exploration of Western North America*. 248 pp.
- 1983 Bowman, Robert I., Margaret Berson, and Alan E. Leviton, eds. *Patterns of Evolution of Galapagos Organisms*. 560 pp.
- 1985 Smiley, Charles J., ed. *Late Cenozoic History of the Pacific Northwest*. 417 pp.
- 1986 Valentine, James W., ed. *Phanerozoic Diversity Patterns: Profiles in Macroevolution*. 441 pp. (Published in collaboration with Princeton University Press, Princeton, New Jersey.)
- 1987 Bilderback, David E., ed. *Mt. St. Helens, 1980: Botanical Consequences of the Explosive Eruptions*. 458 pp. (Sponsored by the Pacific Division AAAS; published by the University of California Press, Berkeley, California.)
- 1988 Almeda, Frank, and Catherine M. Pringle, eds. *Tropical Rainforests: Diversity and Conservation*. 320 pp. (Published in collaboration with the California Academy of Sciences, San Francisco, California.)
- 1990 Drake, Ellen T., Gary L. Larson, Jack Dymond, and Robert Collier, eds. *Crater Lake: An Ecosystem Study*. 221 pp.
- 1993 Sharma, Ragubir P., ed. *Dietary Factors and Birth Defects*. ix + 392 pp.
- 1994 Bork, Kennard Baker. *Cracking Rocks and Defending Democracy: Kirtley Fletcher Mather, 1888–1978*. 342 pp.
- 1995 Hollibaugh, James T., ed. *San Francisco Bay: The Ecosystem*. 550 pp.
- 1995 Kruckeberg, Arthur, Richard B. Walker, and Alan E. Leviton, eds. *Genecology and Ecogeographic Races*. 285 pp.
- 1998 Guitjens, John, and Lynn Dudley, eds. *Agroecosystems and the Environment: Sources, Control and Remediation of Potentially Toxic, Trace Element Oxyanions*. 213 pp.
- 2004 Leviton, Alan E., and Michele L. Aldrich, eds. *Museums and Other Institutions of Natural History: Past, Present, and Future*. 329 pp. (Published in collaboration with the California Academy of Sciences, San Francisco, California in the Academy's *Proceedings* series, ser. 4, vol. 55, Suppl. I.)
- 2005 Jablonski, Nina G., and Michael T. Ghiselin, eds. *Biodiversity and Taxonomy*. 236 pp. (Published in collaboration with the California Academy of Sciences, San Francisco, California in the Academy's *Proceedings* series, ser. 4, vol. 56, Suppl. I.)

FROM THE PROCEEDINGS

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- 1984 Awbrey, Frank, and William Thwaites, eds. *Evolutionists Confront Creationists*. 1(3):1–213.
- 1985 Kilbourne, Brock K., ed. *Scientific Research and New Religions*. 2(2):1–178.
- 1996 Goldstein, Bernard, ed. *California's Master Plan for Higher Education in the Twenty-first Century*. 15(2):1–118.

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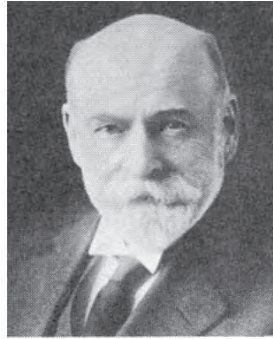
- 1978 Mathias, Mildred E. *The Importance of Diversity*. 11 pp.
- 1984 Baker, Herbert G. *The Future of Plants and Vegetation under Human Influence*. 14 pp.
- 1985 Wright, Barbara E. *Cause and Effect in Heredity, Differentiation, and Aging*. 16 pp.
- 1992 Wolfle, Dael. *Prediction in Science*. 14 pp.
- 1997 Granger, Orman. *Global Environmental Change and the Politics of Uncertainty*. 30 pp.

**A GALLERY OF PORTRAITS
PRESIDENTS
and other
OFFICERS
of the Pacific Division
American Association for the
Advancement of Science
1916–2010**

Presidents of the AAAS Pacific Division



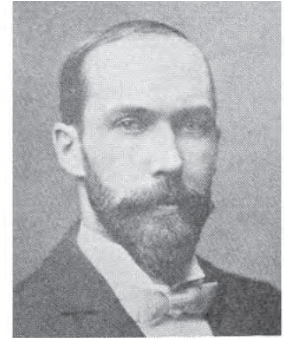
W. W. Campbell, 1916



J. C. Branner, 1917



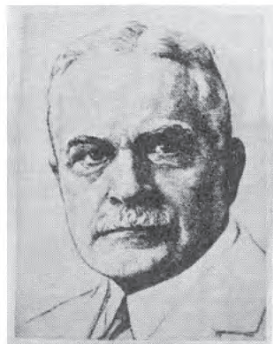
D. T. MacDougal, 1919



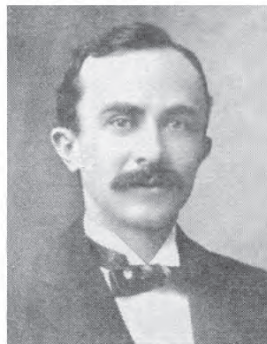
J. C. Merriam, 1920



W. R. Ritter, 1921



B. W. Evermann, 1922



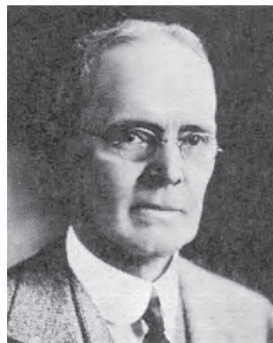
E. P. Lewis, 1923



D. S. Jordan, 1924



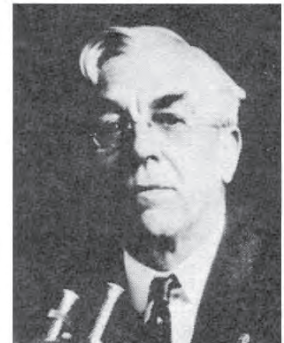
C. E. Grunsky, 1925



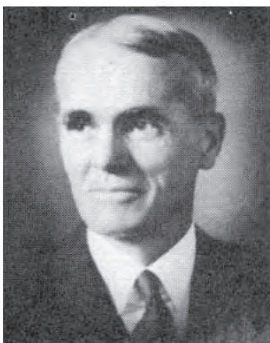
R. G. Aitkin, 1926



A. A. Noyes, 1927



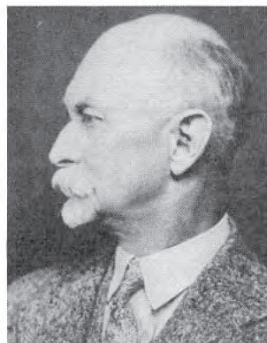
C. A. Kofoid, 1928



W. S. Adams, 1929



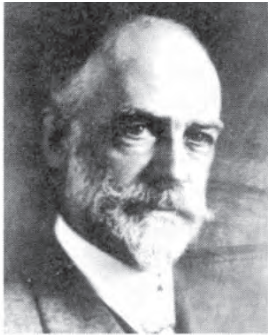
D. H. Campbell, 1930



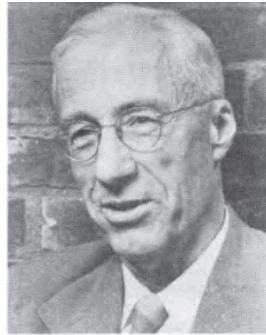
T. W. Vaughan, 1931



A. O. Leuschner, 1932



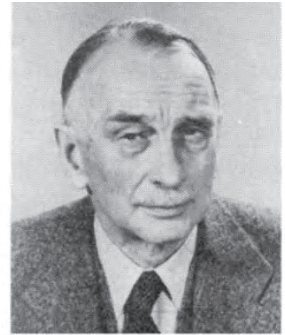
W. F. Durand, 1933



J. H. Hilderbrand, 1934



B. Willis, 1935



R. C. Tolman, 1937/37



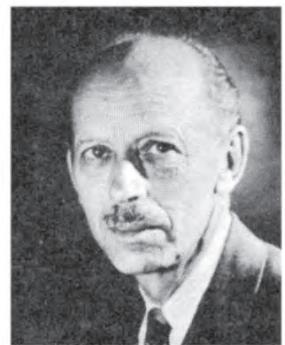
J. S. Plaskett, 1938



S. J. Holmes, 1939



L. M. Terman, 1940



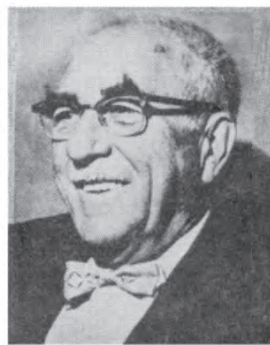
H. U. Sverdrup, 1941



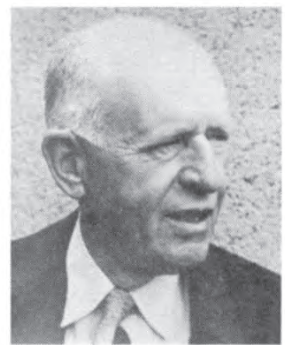
D. R. Haogland, 1942



L. Pauling, 1946



T. G. Thompson, 1947



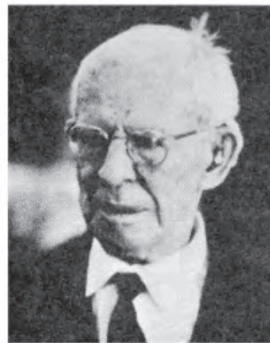
R. E. Clausen, 1948



L. S. Cressman, 1949



L. M. Klauber, 1950



C. H. Danforth, 1951



H. A. Spoehr, 1952



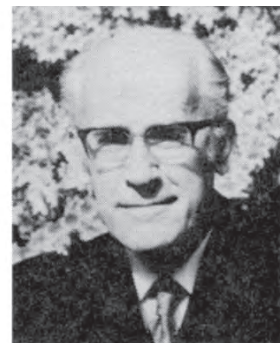
C. D. Shane, 1953



A. H. Sturtevant, 1954



E. R. Guthrie, 1955



R. B. Brode, 1956



J. M. Luck, 1957



I. Campbell, 1958



H. Eyring, 1959



H. P. Hansen, 1960



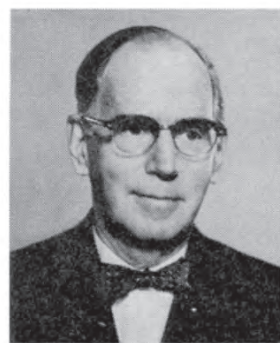
W. A. Clemens, 1961



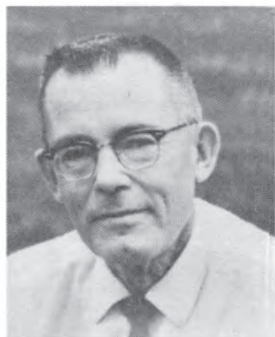
M. Calvin, 1962



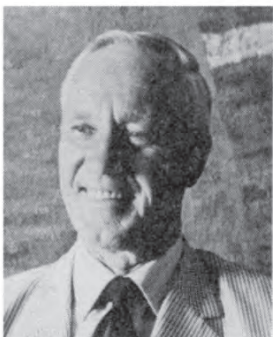
J. P. Tully, 1963



P. E. Church, 1964



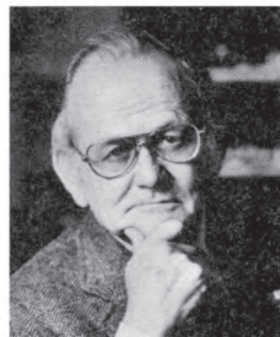
J. F. Bonner, 1965



D. C. Aldrich, Jr., 1966



A. Hecht, 1967



G. Hardin, 1968



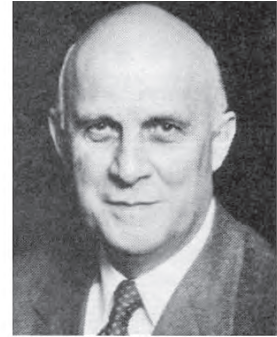
W. C. T. Snyder, 1969



T. L. Jahn, 1970



G. E. Lindsay, 1971



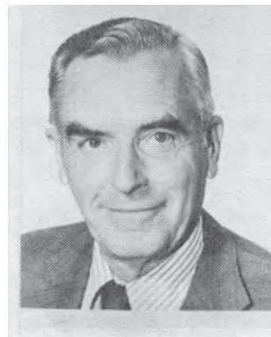
R. A. Young, 1972



J. D. Isaacs, 1973



R. C. Miller, 1974



G. A. Zentmyer, Jr., 1975



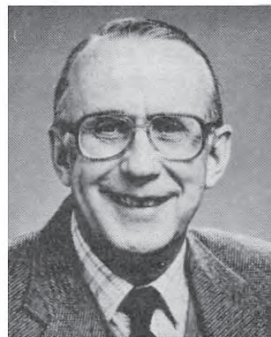
R. B. Walker, 1976



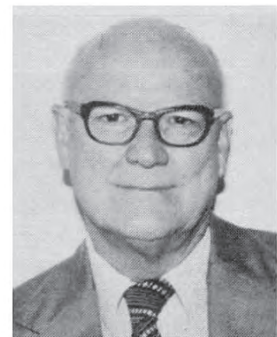
R. T. Orr, 1977



M. E. Mathias, 1978



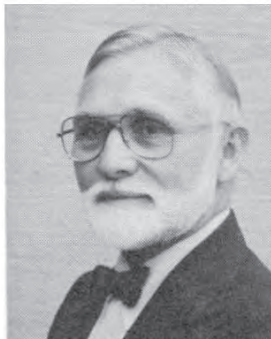
G. C. Lewis, 1979



W. L. Sims, 1980



B. M. Sweeney, 1981



R. I. Bowman, 1982



H. G. Baker, 1983



R. H. Jahns, 1984A



B. E. Wright, 1984B



W. H. Gardner, 1985



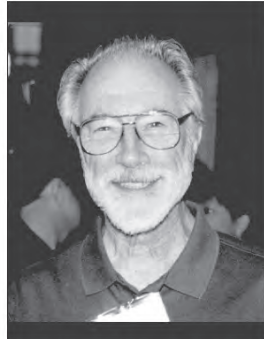
G. G. E. Scudder, 1986



T. J. Conomos, 1987



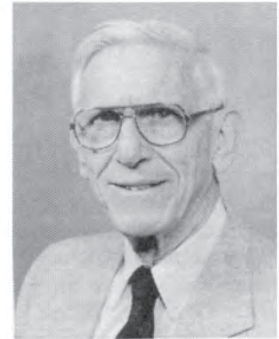
O. E. Smith, 1988



J. W. Valentine, 1989



F. N. Nichols, 1990



E. Epstein, 1991



D. Wolfle, 1992



W. F. Campbell, 1993



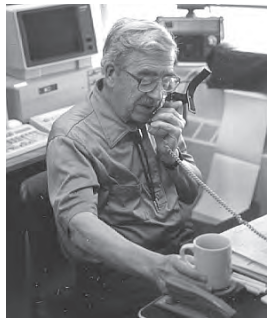
D. R. Stoddart, 1994



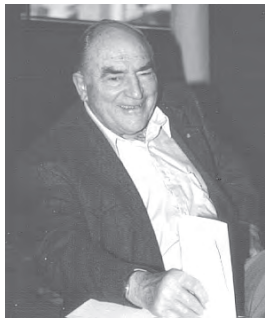
E. B. Leopold, 1995



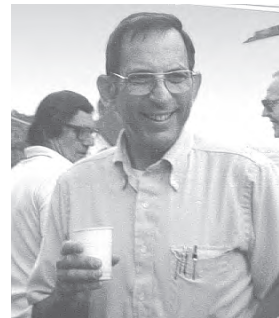
O. Granger, 1996



J. T. Dutro, Jr. 1997



L. B. Leopold, 1998



A. E. Leviton, 1999



R. W. Peterson, 2000



G. Curtis, 2001



N. G. Jablonski, 2002



J. J. Carroll, 2003



W. B.N. Berry, 2004



L.. Dudley, 2005



K. M. Fisher, 2006



C. Maida, 2007



T. M. Gosliner, 2008



A. A. Sturz, 2009



J. Hafernik, 2010

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Executive Directors of the Division**

Unavailable



W. W. Sargeant
1919–1927

Unavailable



J. M. Luck
1930–1942

A. L. Barrows
1916–1918



R. C. Miller
1946–1973



R. T. Orr
1973–1975



A. E. Leviton
1975–1998, 2001



D. E. Bilderback
1998–2001



Roger Christianson
2002–

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Standards of Conduct

On April 14, 1978, the AAAS Board of Directors adopted the following position statement regarding standards of conduct at AAAS meetings:

“The Board takes it for granted that all who attend the Annual Meetings of the Association will conduct themselves with consideration for others and with particular consideration for those who generously give their time and thought to the sessions. Differing opinions will continue to be heard and respected. We recognize that there are areas of science that are both controversial and troubling. The Annual Meeting can serve as an effective forum to consider such issues so long as procedures of orderly debate and fairness are followed. Discourtesy and abusive behavior have no place in the annual Meeting. When excesses occur they do great injury to the Association and to the process of discussion. They cannot be condoned.”

The AAAS, Pacific Division, as part of the larger organization, ascribes to this position and will, if necessary, take appropriate measures to assure adherence to it.

No Smoking Rule

On December 30, 1971, the AAAS Council approved a motion requesting that persons in attendance refrain from smoking at Council meetings and scientific and public sessions. The AAAS, Pacific Division ascribes to this policy and asks that all persons who attend the meeting comply with this ruling.

Meeting Development

The technical programs of AAAS, Pacific Division meetings are developed by proposals submitted by individuals and/or groups of individuals and overseen by the Executive Committee and Executive Director of the Division. Symposium planners are responsible for developing lists of presenters that represent fairly the topic at hand. Papers submitted separately from symposia, referred to as Contributed Papers and Contributed Posters, are reviewed by section chairs prior to their inclusion in the program.

All program review is based on scientific significance, timeliness, balance, and clarity of organization. In the case of symposia and workshops, this review is based on materials provided by planners or submitters and does not include a technical examination of individual presentations.

Student Awards of Excellence

The Council, Executive Committee and officers of the AAAS, Pacific Division are committed to encouraging the scientific development of students by offering them a friendly yet scientifically robust environment in which to present their research results. Part of that environment includes evaluating student presentations and rewarding students' superior efforts. To that end, the Division has developed an extensive program of student Awards of Excellence that are given at both the sectional and divisional levels. More information about this program may be found on page 30 of this Proceedings.

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Assembled and edited by Roger G. Christianson. Co-edited by Angela R. Christianson.

Front Cover: Base Pair, a painting by Julie Newdoll, www.brushwithscience.com, oil on canvas, 18" x 24", 2003.

A spiraling couple, frozen for an instant, is revealed to us exposing the tension and attraction between the bases, between male and female, between the scientists involved in the discovery of the structure of DNA. The delicate hydrogen bonds between bases is the premise for a dance that can never stop as long as life continues. —Julie Newdoll

Back Cover: Membranes 1, a painting by Shoshanah Dubiner, www.cybermuse.com, gouache on Arches watercolor, 20" x 26", 2007.

A double-layered membrane surrounds the contents of every cell, without which those contents would flow into an undifferentiated "soup." Membranes allow for endless diversity. In this image, by analogy, the membrane becomes a "skin" around a body, a shape around speech, an enclosure for meaning.

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Stephen Frost, Department of Anthropology, University of Oregon, Eugene, OR
Frank Jacobitz, Department of Engineering, University of San Diego, San Diego, CA
Alan E. Leviton, California Academy of Sciences, San Francisco, CA
Carl A. Maida, Schools of Dentistry and Medicine, University of California, Los Angeles, CA
Owen M. McDougal, Department of Chemistry and Biochemistry, Boise State University, Boise, ID
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Anne A. Sturz, Associate Dean, University of San Diego, San Diego, CA

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SOUTHERN OREGON UNIVERSITY

OFFICE OF THE PRESIDENT

Dear AAAS Pacific Division Participants:

Welcome to the campus of Southern Oregon University! I am delighted that SOU has the opportunity to host the AAAS Pacific Division conference here in Ashland.

As president of SOU, I continually experience the amazing creative energy of this university. At SOU, we not only offer outstanding academic programs but also nourish the spirits of our students in a safe, beautiful campus environment. Our University mission is summarized in one sentence:

Southern Oregon University is an inclusive campus community dedicated to student success, intellectual growth, and responsible global citizenship.

We are committed to **connecting** our students—with faculty, with the region, and with the issues facing our global society. Every year several thousand of our students go out into our communities. They do civic engagement projects; they volunteer in businesses and cultural institutions such as Oregon Shakespeare Festival and Rogue Valley Symphony. They work on capstone and research projects that help agencies and businesses. Our students don't just learn theory—they put their knowledge and talents to practical use.

We offer connected, personalized learning experiences in small classes taught by full-time faculty. In collaboration with partners throughout southern Oregon, we design curriculum that contributes to the environmental sustainability of our region, inspires creative thinking and leadership, and emphasizes practice beyond the classroom.

Central to our commitment to responsible global citizenship, SOU values opportunities for our students to study abroad—and for international students to study here at SOU. We have partnerships stretching over 40 years with the Universidad de Guanajuato in Mexico and Dankook University in South Korea as well as partnerships with international universities worldwide.

SOU is truly a special place. While you are here, I hope you will tour our campus and learn about our academic programs and student life.

Again, I wish you the warmest welcome.

Sincerely,



Mary Cullinan
President, Southern Oregon University

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hafernik@sfsu.edu

June 13, 2010

Dear Conference Attendees:

Welcome to the 91st Annual Meeting of the Pacific Division of the AAAS sponsored by Southern Oregon University. We have all the makings of a terrific meeting, an exceptional program, a wonderful venue and the opportunity to explore the synergy between art and science. This year's theme "The Art of Science" provides a thread that links many of this week's activities. There is an elegance to the natural world that science and art can provide complementary views of. Done well, results of scientific studies can be as deeply moving as a great sculpture or painting. On the other hand, great art can open doors to a deeper understanding of the world around us and challenge us in ways that are often novel and sometimes unpredictable. At this meeting, we have a special opportunity to experience the art of science in the many excellent symposia and technical presentations and to view science from artists' perspectives in the various Science-Art exhibits around campus.

Southern Oregon University provides an exceptional location for our meeting. As you enjoy your stay in Ashland, be sure to take advantage of the opportunity to explore nearby natural areas, take in a play at the Shakespeare festival and learn more about the many things southern Oregon has to offer.

I look forward to seeing all of you at the social events, technical sessions, public lectures, workshops and field trips.

A handwritten signature in black ink that reads 'John Hafernik'.

John Hafernik, Ph.D.
President, AAAS, Pacific Division



Future Meetings

Pacific Division Annual Meetings

2011.....12 – 15 June in San Diego, CA

Join in on the fun as the 7th World Mummy Congress joins us at the University of San Diego.

2012.....24 – 27 June in Boise, ID

Still tentative, but it's looking good! We're heading back to the Convention Center in Boise for another co-located meeting with the Snake River Section of the American Chemical Society.

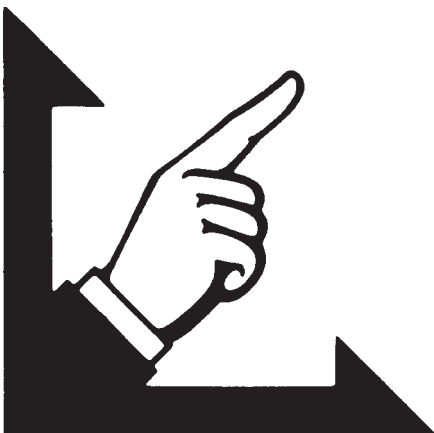
2013.....Where do you think we should meet?

AAAS National Meetings

2011.....17 – 21 February in Washington, D.C.

2012.....16 – 20 February in Vancouver, B.C.

2013.....14 – 18 February in Boston, MA





SOU Photographic Services

Churchill Hall, on the campus of Southern Oregon University

**91st Annual Meeting
of the
AAAS, Pacific Division
SOUTHERN OREGON UNIVERSITY
ASHLAND, OR
13 – 17 June 2010**

GENERAL INFORMATION

**PACIFIC DIVISION SECTIONS
SPONSORING SESSIONS at the
ASHLAND MEETING**

- Agriculture and Horticultural Sciences
- Anthropology and Archaeology
- Atmospheric and Oceanographic Sciences
- Cell and Molecular Biology
- Chemistry and Biochemistry
- Computer and Information Sciences
- Earth Sciences
- Ecology, Organismal Biology and Environmental Sciences
- Education (Science and Technology)
- General and Interdisciplinary
- Health Sciences
- History and Philosophy of Science
- Industrial Sciences and Technology
- Mathematics
- Oral Biology and Dental Medicine
- Physics and Materials Science
- Psychology
- Social, Economic and Political Sciences

SOUTHERN OREGON UNIVERSITY

Southern Oregon University (SOU) is a contemporary, public liberal arts university focused on student learning, accessibility, and civic engagement that enriches both the community and bioregion. The university is recognized for fostering intellectual creativity, for quality and innovation in its connected learning programs, and for the educational benefits of its unique geographic location.

SOU was the first university in Oregon—and one of the first in the nation—to offset 100 percent of its energy use with clean, renewable power. The Environmental Protection Agency (EPA) listed SOU as one of the nation’s Top 20 “Green” Colleges and Universities, and President Cullinan has signed the American College and University Presidents Climate Commitment.

Named a “hidden gem” of higher education by The New York Times, SOU has been designated a Center of Excellence in the Fine and Performing Arts by the Oregon University

GENERAL INFORMATION

System (OUS). It is one of twenty-one institutions across the nation selected for membership in the Council of Public Liberal Arts Colleges (COPLAC).

Enrolling approximately 5,100 students, SOU addresses regional needs through its academic programs, partnerships, public service, outreach, sustainable practices, and economic development activities.

Students choose from more than 100 areas of study, including 34 majors in the sciences, the arts, business, and education. The university's student-to-faculty ratio of 21:1 allows for small, individualized classes and close mentoring relationships between students and faculty. All classes are taught by faculty—not graduate students. As many as 93 percent of SOU faculty hold the highest degrees in their fields.

SOU serves the whole of southern Oregon and the northernmost counties of California. It is engaged internationally through a strong proportion of students from other nations, many exchange programs, and longstanding sister university alliances, the flagship being the Universidad de Guanajuato, Mexico.

Whether they are revolutionizing the wine industry, discovering new microbial species in Crater Lake, or predicting and confirming ferroelectric materials, Southern Oregon University faculty and students are pursuing world-class research that is putting southern Oregon on the scientific map. SOU offers undergraduate students rare opportunities to engage in graduate-level investigations under the mentorship of distinguished researchers. Interdisciplinary projects such as the acid mine drainage (AMD) research conducted by the Biology, Chemistry, and Geology Departments exemplify the rich academic community and the synthesis of expertise present at SOU. As its faculty and students engage in vanguard investigations, Southern Oregon University will continue to fuel the local economy and knowledge base through dedicated, interdisciplinary research rooted in the region.

SOU's main campus in Ashland is largely residential in character. On-campus housing includes three complexes with residence halls and superb dining, family housing with childcare service, and a facility for visiting groups participating in the university's educational enrichment offerings.

THE REGION

Southern Oregon University is located in a uniquely diverse geographic, geological, and ecological area. It is distinguished by the Rogue, Umpqua, and Klamath Rivers; Crater Lake and Shasta National Parks; many lakes; and the convergence of three mountain ranges: the Cascades, the Siskiyou, and the Coast Range. Such qualities give rise to the university's distinctions in environmental studies, as well as its tremendous recreational opportunities—including golf, rafting, fishing, sailing, hiking, skiing, biking, horseback riding, and camping.

Art and culture, recreation, tourism, retail sales, natural resources, and the burgeoning healthcare services are the driving forces of the region's economy. Technology industries

are diversifying the economy as new companies move into the area, start-up firms emerge, and technology advances locally. There are three medical centers that offer world-class healthcare services.

The region hosts five fairs and thirteen festivals, in addition to nearly thirty art galleries and more than two dozen cultural and art museums. The most notable festivals are the Oregon Shakespeare Festival (OSF) in Ashland and the Britt Music Festival in Jacksonville. Among the theater venues for visiting and local performances is Medford's Craterian Ginger Rogers Theatre. Recreational facilities include 151 public and 110 commercial campgrounds, seventeen golf courses, three racetracks, two ski areas, two ice-skating rinks, and four horse stables. There are sixty-four registered guided tours in southern Oregon.

ASHLAND and SOU

Southern Oregon University is located in Ashland at the base of the Siskiyou Mountains in the Rogue Valley. It is about a five-hour drive or a one-hour flight from Portland to the north or from San Francisco to the south. With a population of 20,000, the town boasts eighty-five restaurants and ninety-three lodging facilities, sixty-six of which are bed and breakfasts. Its restaurants, delis, bakeries, banks, bookstores, ice-cream parlors, vintage movie theater, specialty shops, and clothing stores are within easy walking distance of the campus. The annual Ashland Independent Film Festival (AIFF) is a popular attraction, as is the ScienceWorks hands-on museum. A bicycle path leads from SOU to downtown Ashland and beyond. The city offers an ideal setting for picnics and strolls in the beautiful Lithia Park, with its duck ponds, paths, arboretum, and creek.

Ashland is surrounded by forests, mountains, lakes, and rivers that provide spectacular areas for outdoor sports and ecological studies. With an average rainfall of twenty inches, Ashland benefits from a mild four-season climate. Although the valley floor is generally free of snow, winter recreational facilities are just a thirty-minute drive away at Mount Ashland Ski and Snowboard Resort, which sits at 7,500 feet elevation. Just minutes away, Emigrant Lake offers waterslides, sailing, and a park. Several mountain lakes are within an hour or less drive from Ashland.

SOU and the community are focal points for rich cultural activities and organizations. Ashland is home to the Oregon Shakespeare Festival, one of the top five regional theatres in the nation and top three worldwide rotating repertory theatres with Shakespeare at their core. OSF was created in 1935 by Angus Bowmer, a theatre professor at Southern. The festival draws more than 380,000 patrons annually. The university's Schneider Museum of Art hosts major art exhibitions and youth programs, and the Center for the Visual Arts (CVA) exhibits artworks by faculty, students, and visiting artists. SOU is home to the Southern Oregon Repertory Singers, the Rogue Valley Symphony, and Chamber Music Concerts. Its Performing Arts Department also provides frequent concerts, recitals, and productions by exceptional faculty and students.



On the Southern Oregon University campus.

SOU Publications Services

ASHLAND CAMPUS

SOU occupies a 175-acre campus with fourteen academic buildings, thirteen residence halls, family housing, a student union, and multiuse facilities. All classrooms on campus are accessible to disabled students. Beautifully landscaped grounds and architecturally pleasing buildings provide a pleasant environment for academic endeavors, student club activities, and opportunities to think and study together with peers and faculty. SOU recently completed a major renovation and expansion of Hannon Library, nearly doubling the size of the facility. The expanded building features ample study spaces, seminar rooms, reading areas with fireplaces, and a coffee shop, as well as integrating contemporary learning technologies.

Ashland and SOU house many special facilities and services, such as the nation's only Fish and Wildlife Forensics Laboratory and the nationally recognized Jefferson Public Radio (JPR). Southern Oregon University hosts one of the largest Native American powwows in the area and a popular Hawaiian Luau, both of which are coordinated by student multicultural groups. It offers the only Native American Studies certificate and minor programs in Oregon, in addition to providing a popular education program for Native American youth in the summertime. Among its extensive array of programs for youth is the award-winning Academia Latina program for middle school Hispanic and Latino children. SOU also has an established reputation for the size and scope of its lifelong learning programs.

SOU STATISTICS

In the 2008–09 academic year, SOU boasted a total enrollment of 5,100 students. Students from Oregon represented 70.5 percent, while eighty students came from countries around the world. The average class size was twenty-five. 📖

-SOU Publications Services

ANNUAL MEETING

REGISTRATION

The Registration Center will be set up in the main entry to Science Hall on the SOU campus and will be open as follows:

Sunday, 2:00 p.m. – 6:00 p.m.

Monday, 7:30 a.m. – 4:30 p.m.

Tuesday, 7:30 a.m. – 4:00 p.m.

Wednesday, 7:30 a.m. – 3:00 p.m.

All persons planning to attend the meeting, except for public sessions, should be registered for the meeting and must wear their name badges at all times. On-site registration fees are as follows: full-meeting professional, \$115; K–12, community college teachers, post-docs, retirees/emeritus, and unemployed, \$60; and students and participating spouses, \$40. One-day on-site professional registration is \$85. Note that if you attend more than one day, you must pay the full registration fee. Program organizers and presenters registering in the professional category may purchase a full-meeting professional registration at the reduced, one-day rate. To be eligible for this discount, the individual must be listed as an organizer or co-organizer of a program or be making a presentation at the meeting.

Special stipends of \$75 were given to the first twenty K–12 and community college instructors that registered in advance for the meeting and requested the stipend on their registration forms. The stipend is not available for teachers who register on-site.

Students were given the opportunity to apply for travel awards of up to \$150 each to help defray their costs for the meeting.

About field trips: Due to limited seating in the vehicles and the need to inform some destinations of the number of people arriving, pre-registration for all field trips was required. However, space may still be available on some of the excursions. If you didn't register for a particular field trip on which you are interested in participating, please inquire at the Registration Center to see if space is still available. At least one member of a family group requesting field trip reservations must be a paid meeting registrant. Participants who are not registered for the meeting will be charged a one-time \$10 field trip registration fee in addition to the fee for the field trip.

About workshops: All workshops, with the exception of *Geometry as a Design Tool*, which requires a \$5 fee to help pay for supplies, are available at no additional charge to persons registered for the meeting. Some workshops may have limited space, so it is suggested persons interested in attending arrive early.

About refunds: Requests for refunds must have been in writing and received in the Pacific Division office no later than 20 May 2010. Under extreme hardship conditions beyond a registrant's control, requests for refunds may be honored beyond this date if presented in writing with an adequate explanation of the hardship that precipitated the request for the refund. A

GENERAL INFORMATION

\$15 handling fee is applied to all refunds. An additional 3.5% deduction is applied to the total amount for credit card refunds.

CAMPUS HOUSING PACKAGES

On-campus housing for this meeting is in Cox Hall, and was available by advance purchase only. There are two types of rooms, “classic” dorm rooms and “suites.” The classic dorm rooms share a bathroom, which is located down the hall. Each floor of Cox Hall has two large bathrooms, one for men and one for women. Each bathroom has three sinks, three shower stalls and four toilet stalls. Each shower stall has a small dressing area associated with the shower. Flip flops are a good idea for visits to the bathroom. Each of these classic rooms has two extra-long, twin-sized beds, two desks, two chairs and two closets. The rooms do not have refrigerators, microwaves or telephones. All bedding, including pillows and towels, are provided. Those driving and wanting to park on campus need to have purchased a parking permit for \$27.

The suites in Cox hall each have a private bathroom, mini-refrigerator, microwave and telephone. They typically have two double-sized beds, though a few have a queen bed. The rooms are set up similar to hotel rooms, though they don’t have televisions. Some suites have showers and others have tub/shower combinations.

Cox Hall has very limited internet and computer availability. There is one computer in each of the lounges on the first and second floors. Limited wireless connectivity is available on the ground floor of the building but it’s spotty. Wireless availability is much better on campus where the meeting will take place, and computers are available for general use in the Library.

There is a communal kitchen area on the ground floor of Cox Hall with a stove, microwave and refrigerator. There is also a microwave and small refrigerator in the first floor lounge of Cox Hall. All rooms in Cox Hall have individual air conditioning units, and the building has an elevator.

All outside doors to Cox Hall are locked at 7:00 p.m. University age and older guests are provided an outside door key. All guests are provided a room key. A \$60 fee is charged for lost keys (in order to replace the lock). Housing staff is available from 7:00 p.m. to 7:00 a.m. to help guests.

Important note about smoking and alcohol on the Southern Oregon University campus: All indoor areas on campus, including Cox Hall, are smoke-free. Also, alcohol is not allowed in public areas on campus.

Room/board packages, available by advance purchase only, include specified meals at the Cascade Food Court. Guests will be issued meal cards with which they gain access to the Food Court. Meals are served buffet style and are “all you wish to eat.” Desserts and drinks are included. Cards are good for everything except prepackaged food items.

The following room/board packages were available for meeting attendees: *Three-nights* (in on Sunday, 13 June and

out on Wednesday, 16 June), including six meals: breakfast and lunch MTW (Monday, Tuesday and Wednesday); *Four-nights* (in on Sunday, 13 June and out on Thursday, 17 June), including seven meals: breakfast MTWTh and lunch MTW. *Additional nights* may be added prior to the beginning and after the end of the room/board packages. Extra nights do not include any meals.

Prices for room/board packages were as follows:

Three-night packages

classic dorm room, single occupancy: \$210

classic dorm room, double occupancy, per person: \$155

Four-night packages

classic dorm room, single occupancy: \$270

classic dorm room, double occupancy, per person: \$192

suite, single occupancy: \$440

suite, double occupancy, per person: \$290

Additional nights (added to package only—not available separately; do not include any meals)

classic dorm room, single occupancy: \$51

classic dorm room, double occupancy, per person: \$32

suite, single occupancy: \$93

suite, double occupancy, per person: \$55

Parking for those staying in Cox Hall: The cost for a parking permit for those wanting to park an automobile on campus during their stay in Cox Hall is \$27 for a permit good for one week. This permit allows 24-hour in and out privileges in



Cox Hall, location of on-campus housing for this meeting.

any campus parking lot marked red or green, including the lot immediately in front of Cox Hall. There is a limited amount of on-street parking in the vicinity of Cox Hall. Automobiles parked on the street must be moved periodically in order to avoid citation by the Ashland Police Department.

LOCAL HOTELS and MOTELS

Ashland boasts many fine hotels and motels, many of which can be accessed for reservations through websites such as expedia.com or hotels.com. Beds and Breakfasts in Ashland may be found by using this website: <http://www.bandbashland.com/>.

The first three hotels listed below are provided to help identify ones close to the meeting. The fourth is in downtown Ashland, about a 10 to 15 minute walk from the University. Please make your reservations for housing directly with the hotel/motel of your choice. Rates listed are examples collected on 4 March 2010 for the dates of the meeting. Note that the AAAS, Pacific Division lists the following hotels for information only, not as an endorsement for any specific commercial enterprise.

Ashland Motel

1145 Siskiyou Boulevard, Ashland, OR.
541-482-2561.

www.ashlandmotel.com

Rate: \$77 – \$100 (2 persons)

Proximity to meeting: across the street; a 5 minute uphill walk

The Palm

1065 Siskiyou Boulevard, Ashland, OR
800-691-2360

www.palmcottages.com

Rate: \$99 – \$113 (2 persons)

Proximity to meeting: across the street; a 5 minute uphill walk

Flagship Inn

1193 Siskiyou Boulevard, Ashland, OR
800-547-6414

www.ashlandflagshipinn.com

Rate: \$92 – \$119 (2 persons)

Proximity to meeting: across the street; a 5 minute uphill walk

Ashland Springs Hotel

212 E. Main Street, Ashland, OR
541-488-1700 or 1-888-795-4545

www.ashlandsspringshotel.com

Rate: \$159 (2 persons); identify yourself as part of the AAAS, Pacific Division meeting

Reservation deadline: 30 April 2010

Proximity to meeting: approximately 3/4 mile; a very pleasant and slightly uphill 15 minute walk

TRAVEL to the MEETING

By automobile from the south: Southern Oregon University is located about 14 miles north of the California border on Inter-

state 5. Coming from the south, take Exit 14 from I-5. Turn left at the STOP sign and follow Hwy 66 (Ashland Street) toward town. At the third signal (Siskiyou Boulevard), be in the left lane and proceed forward by bearing to the right.

- If you are heading to on-campus housing, turn left at the first signal (Indiana St). In about 1/3 block turn left into the parking lot (looks like an alley but opens into a parking lot). Cox Hall faces the parking lot.

- If you are heading onto the SOU campus for the meeting, turn left at the second signal (Mountain Avenue). Proceed up the hill and turn left into the parking lot, just before the STOP sign.

By automobile from the north: take Exit 19 from I-5. Turn right at the STOP sign and proceed to the signal (Hwy 99). Turn left at the signal (Highway 99) and continue driving about three quarters of a mile past downtown Ashland to Mountain Avenue (a signalized intersection).

- If you are heading to on-campus housing, pass Mountain Avenue and continue to the next signal, Indiana Street. Turn right onto Indiana and then left about 1/3 block later into the parking lot (looks like an alley but opens into a parking lot). Cox Hall faces the parking lot.

- If you are heading onto campus for the meeting, turn right onto Mountain Avenue. Proceed up the hill almost to the STOP sign and turn left into the parking lot.

By Air: Ashland has a small airport that is not served by commercial carriers. However, Medford, situated about 15 miles to the northwest of Ashland, is served by several major airlines. Car rentals (Avis, Budget, Enterprise, Hertz, and National/Alamo) are available at the airport. The airport is also served by several taxi and shuttle companies. Additional information may be found on this website: <http://www.co.jackson.or.us/Page.asp?NavID=2532>. The airport is about a 25 minute drive from the University.

ON-CAMPUS PARKING

On-campus parking is available at no charge in Green Lot 30, which is on the east side of Mountain Avenue (left side when going uphill toward Ashland Street), at the corner of Ashland Street. The entrance to this lot is from Mountain Avenue. Lot 30 is close to and kitty-corner from Science Hall, where the majority of the meeting will take place. Do not park in any other lots because you will be ticketed by campus Parking Services unless you are staying in Cox Hall and have previously purchased a parking permit. Persons staying in Cox Hall and purchasing a parking pass may park in any Red or Green lot on campus.

REGISTRATION CENTER

The Registration Center will be set up in the lobby of the main entrance to Science Hall on the Southern Oregon University campus. Hours of operation are:

Sunday: 2:00 p.m. – 6:00 p.m.

Monday: 7:30 a.m. – 4:30 p.m.

Tuesday: 7:30 a.m. – 4:00 p.m.

Wednesday: 7:30 a.m. – 3:00 p.m.

MESSAGES

To leave a message for a meeting registrant or to contact the AAAS, Pacific Division staff, call 541-292-1115. Please note that this line will be monitored only between the dates of 13 and 17 June. After these dates, please use the regular Pacific Division number, 541-552-6869, in order to contact Pacific Division staff.

BREAKS

Mid-morning and mid-afternoon breaks are scheduled, as appropriate, for each session. Refreshments will be served during break times at a location near the Registration Center in Science Hall.

The Pacific Division would like to especially thank these sponsors for our breaks:



Harry & David for the Monday afternoon "Candy Bar" break



and Starbucks Coffee for the donation of coffee for the morning breaks.

MEETING ROOMS, COMPUTERS, and POWERPOINT PRESENTATIONS

Technical sessions will meet primarily in Science Hall, but may also make use of rooms in the Hannon Library and other buildings on the Southern Oregon University campus. All meeting rooms are equipped with LCD projectors and computers running Windows XP and Microsoft Office 2007. If you are planning to use PowerPoint for your presentation, you must make sure that it will run on the Windows platform. Only CD-ROMs and thumb/USB/flash drives may be used to load presentations onto the computers. If you are preparing your presentation on a Macintosh computer, make sure it will load to a computer running Windows XP. Be aware that a PowerPoint developed on a Mac may look and/or behave differently on a Windows PC and vice versa.

Speakers requiring other specialized equipment such as slide or overhead projectors must have made their requests known when they submitted their abstracts. If available, specialized equipment will be provided. If rental costs are incurred, payment is the responsibility of the requestor.

DATES, TIMES and LOCATIONS of PRESENTATIONS

The meeting rooms and times of presentations and abstracts for the meeting are published in this "Program with Abstracts" issue of the Proceedings (Vol. 29, part 1), which is given to each meeting registrant.

POSTER SESSIONS

Posters are assigned a display space of 40" tall X 60" wide (1 m X 1.5 m) and are grouped by discipline and subject matter. By action of the Council of the Pacific Division in order to assure fairness, all student posters must fit within the assigned display space to be eligible for student Awards of Excellence. Use of extra space will disqualify a student from the award competition. Posters are to be mounted using map pins on foam core backings (supplied).

Posters are grouped by discipline and subject matter. Each poster session includes both students and professionals. Presenters should have their posters in place at least 10 minutes prior to the start of their session and must be available for at least one hour during the session in order to discuss their results with interested persons. Students competing for Awards of Excellence must be present for at least two hours to allow judges the opportunity to discuss their work and to evaluate their posters. All posters must be removed within 30 minutes of the end of the session.

Presenters assume full responsibility for the security of their poster materials. Unclaimed posters will be discarded at the close of the technical sessions of the meeting on Wednesday.

Additional information about posters, student judging of posters, etc., is on page 59 of these *Proceedings*.

STUDENT PRESENTATION AWARD COMPETITION

The AAAS, Pacific Division offers each affiliated society and section participating in the annual meeting the opportunity to recognize outstanding student participants through the presentation of Awards of Excellence and cash prizes of \$150 for first place and \$75 for second place. Additionally, each winner receives a one-year student membership in AAAS, which includes weekly issues of Science magazine. Societies often supplement these awards with their own cash prizes.

For this meeting, seven Division-wide awards are available: Laurence M. Klauber Award for Excellence (unrestricted); Geraldine K. Lindsay Award for Excellence in the Natural Sciences; J. Thomas Dutro, Jr. Award for Excellence in the Geosciences; Presidents' Award for Excellence (unrestricted); Rita W. Peterson Award for Excellence in Science Education; Best Poster Award (for posters only but otherwise unrestricted); and the AAAS-Robert I. Larus Travel Award, which provides travel and other expenses for the awardee to attend the national meeting of AAAS in Washington, D.C., 17 – 21 February 2011, for the purpose of presenting their winning presentation as a poster. These Division-wide awards are given to those students whose presentations are judged the most significant in the advancement or understanding of science, and are generally chosen from among the first place winners of the sectional competitions.

To be eligible for a sectional or Division-wide award, a student must be registered for the meeting, present the paper

or poster, and be the principal research investigator. Student presentations, oral and poster, are judged on their abstracts, content, style of delivery or presentation, and audiovisual aids and/or handouts (if used). Sample evaluation forms for both oral and poster presentations are posted on the Division's meeting web page.

Students who are eligible for Awards of Excellence are invited to be the Division's guests at the annual Banquet Tuesday evening, 15 June. Festivities that evening include the presentation of student awards. Students were asked to indicate on the Advance Registration Form if they were planning to attend the banquet. Those who responded positively were provided a ticket along with their other registration materials. If you are a student who is in competition for an Award of Excellence and you do not have a ticket for the banquet, please inquire at the Registration Center to see whether any tickets are still available.

IMPORTANT NOTE: All judging for student awards ends by 3:00 p.m. on Tuesday, at which time the judges go into closed session to determine the winners. If you are a student wishing to compete for an Award of Excellence and your oral symposium presentation is scheduled later Tuesday afternoon or Wednesday, you must, in addition to presenting orally as part of the symposium, prepare a poster for presentation at a poster session earlier in the week. Your poster presentation will be judged and you will be in the pool of potential prize winners. A dual entry of this type may only occur if your presentation is part of a symposium and is scheduled to end later than 3:00 p.m. on Tuesday. All oral contributed paper sessions are scheduled to ensure that student presenters are judged prior to the cut-off on Tuesday afternoon.

SPECIAL EVENTS and PUBLIC LECTURES

The following special events are planned for the meeting.

Sunday Afternoon Salmon Bake and Native American Drumming and Blessing. 13 June, starting at 4:15 p.m. in front of Science Hall. At 4:15 p.m., members of Southern Oregon University's Native American Student Union (NASU) will begin drumming and will offer a blessing for the meeting. At 4:30 p.m. a Salmon Bake, co-sponsored by the NASU, will begin. The menu includes wild salmon ceremonially prepared by members of the NASU, green salad, fresh corn on the cob, fresh green beans, rice pilaf, dessert and drinks (iced tea, lemonade and water). Please note that the fresh vegetables are subject to availability and may be substituted if necessary. Cost is \$20 per person. If you didn't purchase a ticket for this event in advance, please check at the Registration Center to see if any tickets are still available. Note that if you are planning to go on the Sunday Wineries field trip, you should arrive back on campus in time to attend this event. However, if you are attending the Oregon Shakespeare Festival production of Hamlet, the play is likely to not be over until sometime between 5:00 and 5:15 p.m., putting you back on campus after 5:30 p.m. and making it difficult to participate in the Salmon

Bake. However, we anticipate the drumming to continue beyond 5:30 p.m., so please join us for that part of the festivities.

Sunday Evening Plenary Program. 13 June, 6:45 p.m. in the Meese Auditorium of the Art Building. Dr. Robert Chinese (California State University Northridge, Northridge, CA, retired) will moderate a panel discussion of a variety of topics surrounding the science-art exhibit which is being held in conjunction with the Pacific Division annual meeting. The discussion will bring together scientists, humanists, curators, and artists to discuss some core issues implicit in the exhibit, such as:

- What did curators and judges of science-themed art look for in order to select art for the show?
- How aware or informed about science did most of the entries appear?
- Given the long tradition of science illustration, some of it recognized as art in its own right, what new elements of science illustration can be considered art in itself?
- What draws artists to science topics more—the visual and representational possibilities of science ideas or theories, or the conceptual theories themselves?
- How much do artists borrow and modify science illustrations as sources of art?
- What contribution to science understanding does/can science-themed art provide?
- How much science gets communicated or lost in artistic renderings of science ideas?
- Must artists have backgrounds in science to make capable science-based art?
- Do scientists find artistic renderings or embellishments of science ideas distortions or clarifications?
- What future collaborations might emerge between scientists and artists?
- (question for the audience) What is your opinion of the art selected?

Sunday Evening Science-Art Exhibit Opening Reception. 13 June, approximately 8:00 p.m. in the foyer of the Art Building. Hosted by the Pacific Division, all registrants and their families are invited to enjoy the conviviality of this informal event, which features soft drinks, beer and chips. The reception begins immediately after the Science-Art Panel concludes and runs to about 9:15 p.m. Please wear your registration badge.

Monday Noon Public Lecture. 14 June, 12:15 p.m. in Science 118. Dr. Amy Shachter (Santa Clara University, Santa Clara, CA) will present an overview of the NSF-funded SENCER program, "Science Education for



Amy Shachter

Photo courtesy herself.

GENERAL INFORMATION

New Civic Engagements and Responsibilities (SENCER): An NSF-funded Science Education Reform Project.” On Tuesday she will present a morning-long workshop on the SENCER program. Please refer to page 51 of these *Proceedings* for more information on the workshop.

Monday Evening Plenary Lecture. 14 June, 7:00 p.m. in Science 118. Ms. Cristina Eisenberg (Oregon State University, Corvallis, OR) will present her lecture, “Frontiers in Ecological Theory: The Role of Wolves as Keystone Predators.”



Cristina Eisenberg

Cascades, and Biodiversity, from which examples for this talk will be drawn, was published in 2010 by Island Press.

Monday Evening President’s Reception. 14 June, 8:00 p.m. at the Schneider Museum of Art. Southern Oregon University President Mary Cullinan will welcome conference attendees at an informal hosted reception from about 8:00 p.m. – 9:30 p.m. All registrants and their families are invited to enjoy this relaxed occasion. Non-registered family members are welcome, but must be accompanied by a registrant. Please wear your registration badge.



Mary Cullinan

Tuesday Noon Public Lecture. 15 June, 12:15 p.m. in Science 118. Dr. Jay Vavra (High Tech High, San Diego, CA) will present the lecture, “The Art of Biology and the Biology of Art: High Tech High Presentation of Learning.”

Tuesday Evening Student Awards Banquet. 15 June, 6:00 p.m. in the Stevenson Union, Rogue River Room. Tuesday evening will be an exciting time for students as Division representatives will announce the names of student winners of sectional



Jay Vavra

Awards of Excellence and also winners of the Division’s Laurence M. Klauber Award for Excellence (unrestricted), Geraldine K. Lindsay Award for Excellence in the Natural Sciences, J. Thomas Dutro, Jr. Award for Excellence in the Geosciences, Rita W. Peterson Award for Excellence in Science Education, the President’s Award for Excellence (unrestricted), the Best Poster Award (for poster presentations only but otherwise unrestricted), and the AAAS Robert I. Larus Travel Award, which provides for travel and other expenses for the awardee to attend the 2011 annual meeting of AAAS in Washington, D.C., 17 – 21 February, in order to present his/her winning presentation as a poster.

The evening begins at 6:00 p.m. with a reception. Dinner service will start at 6:45 p.m. After dinner will be the presentation of student awards, followed by the Presidential Lecture, “Restoring the Urban Jungle: If You Build It Will They Come?” presented by Dr. John Hafernik (Department of Biology, San Francisco State University and President of the Pacific Division). The evening should end by about 9:30 p.m.



John Hafernik

At the time of purchasing their tickets, banquet attendees were asked to choose between three entrees: Vegetarian Lasagna (lasagna with fresh ricotta, mozzarella and parmigiana cheeses); Broiled Salmon with Dill Butter (salmon filet broiled and served with dill butter); and Roast Top Round of Beef. All entrees come with pear and toasted walnut spring salad; baked potato with butter, sour cream and chives; asparagus; freshly baked rolls and butter; dessert; and a choice of lemonade or iced tea.

Students in competition for Awards of Excellence were invited to be guests of the Division for this event. *Note that if you are a student who requested a complimentary ticket, we expect you to attend the banquet. Please don’t dishonor the Division’s generosity in offering you this opportunity to fully participate in the meeting with minimal out-of-pocket expenses by asking for a ticket and then not showing up!*

If you failed to purchase a banquet ticket in advance but would like to attend, please inquire at the Registration Center as to the availability of tickets.

Wednesday Morning Business Meeting of the Council of the Pacific Division. 16 June, 7:00 a.m. in Science 171. The Council of the AAAS, Pacific Division will hold its annual breakfast business meeting at 7:00 a.m. on Wednesday, 16 June. The Council will elect officers, Executive Committee and Council members, discuss programs for the 2011 and 2012 annual meetings, and transact such other business as is required by the Division’s By-Laws. This is an open meeting and Pacific Division members with an interest in the gover-

Photo courtesy herself.

SOU Photographic Services

Photo courtesy himself.

Photo courtesy himself.

nance of the Division are invited to attend.

Wednesday Noon Public Lecture. 16 June, 12:15 p.m.. in Science 118. Dr. Bill Wiecking (Hawai'i Preparatory Academy, Kamuela, HI) will present a talk, "Thinking About Forever: An Interactive Prototype for a Sustainable Educational Facility," wherein he describes the new green Energy Lab on the Hawai'i Preparatory Academy campus.



Bill Wiecking

**INSPIRED by SCIENCE:
A SCIENCE-ART EXHIBIT**

"Inspired by Science," is a show of artworks with a connection to science, a joint program sponsored by the Pacific Division and Southern Oregon University's Schneider Museum of Art. Encompassing not just one display but six different ones, the exhibit takes place in three locations across campus: the Center for the Visual Arts (CVA), the Hannon Library and the Stevenson Union (SU).

In the CVA, on the eastern edge of campus, you will find a group show with half of the selected artists who responded to a national call for art. Also on display is a one-person show by Hiroko Yoshimoto from Los Angeles, and a Cryptogram Biodiversity exhibit from SOU's Biology Department.

On the third floor of the Hannon Library you will find an exhibit about the work of the National Wildlife Forensics Laboratory, located here in Ashland. On the first floor of the library is a display of Science magazine covers featuring some fantastic imagery from years past.

In the SU Gallery, located on the third floor of Stevenson Union, is the other half of the large group show that features diverse takes on science and art in a variety of media.

The exhibit opens Sunday, 13 June with a panel discussion about the exhibits at 6:45 p.m. in the Meese Auditorium in the Art Building (also part of the CVA), followed by light refreshments and viewing of the shows. It runs through early September.

We wish to give a special thanks to Michael Crane, Director of the Schneider Museum of Art, for making this exhibit possible. We also wish to acknowledge and thank all of the artists who responded to our national call for art, including the folks at Science magazine, who worked diligently to provide cover images from a variety of issues of the journal.

Following is a listing of the participating artists:

- | | |
|---------------------------|--------------------|
| Luc Benard/Richard Palais | Terry Nathan |
| Kit Callahan | Rochelle Newman |
| Kathleen Caprario | Linda Lee Nicholas |
| Kathryn Cellerini | Carol Ovenburg |
| Tallmadge Doyle | Ken Patton |
| Shoshannah Dubiner | Patricia Pease |

- Paula Fong
- Brian Gillis/Mike Miller
- J'Sha
- Susan Knight
- Michael Koester
- Flounder Lee
- Liz Lee
- Colombe Leinau
- Clay Lohmann
- Steve Miller
- Myrrh

- AV Pike
- Laurie Rawlins
- Deena des Rioux
- Carlo H. Séquin
- Harriett Rex Smith
- John Sollinger
- James Thompson
- Julian Voss-Andreae
- Hiroko Yoshimoto
- Steve Zolin

Additionally, there will be exhibits of Science Magazine Covers (photos and illustrations), National Wildlife Forensics Lab (photos), and examples from the SOU Collection of Vascular Cryptogram Illustrations (plant drawings).

Please join us!

VIRTUAL SCIENCE-ART EXHIBIT

A second science-art exhibit linked to this meeting is an on-line exhibit in a virtual gallery, hosted by Science Art-Nature and the Stanford Institute for Creativity and the Arts (SiCa) at Stanford University. Please copy this link into your browser in order to enjoy these works of art: <http://www.stanford.edu/group/stanfordbirds/SAN/Exhibit/AAAS-Ashland.html>. We wish to thank Darryl Wheye, CEO of Science Art-Nature, and Donald Kennedy, Editor-in-Chief emeritus of Science magazine, for making this virtual addition to our meeting possible.

OREGON SHAKESPEARE FESTIVAL

The Pacific Division is pleased to offer meeting registrants the opportunity to attend theatrical productions of the Oregon Shakespeare Festival (OSF). Two of the plays are evening performances, starting at 8:30 p.m., and one is a matinee, starting at 2:00 p.m. Two types of seating are available for each showing. "Economy seating" is generally toward the rear of each theatre, though for the performance of Hamlet there are a few tickets up front and to the far side. Economy seating tickets cost \$21 each. "Best available" for Hamlet and Henry IV, Part One are all in the "A+" section (most expensive), while best available tickets for Cat on a Hot Tin Roof span the "B", "A", and "A+" categories. These tickets cost \$60 each. All tickets were available in limited supplies and sold in conjunction with advance registrations. If you failed to purchase a ticket for a play you would like to attend, inquire about availability at the Registration Center.

Important notes:

1. *Those who purchase tickets for the Saturday and/or Sunday plays must plan on stopping by the Ashland Springs Hotel (212 E. Main Street, Ashland) to pick up their tickets, which will be available at the front desk starting at noon on Friday, 11 June. Tickets not picked up by 3:00 p.m. on Sunday, 13 June will be transferred to the Registration Center at Southern Oregon University.*
2. Be aware that *once a play has started, no additional seat-*

GENERAL INFORMATION

ing is allowed until intermission. It is very important that you arrive with plenty of time to park your vehicle and get seated before a play begins.

Cat on a Hot Tin Roof

Saturday, 12 June. 8:30 p.m. in the Angus Bowmer Theatre. *The sultry smell of desire.* It's a long, booze-filled night under Big Daddy's plantation roof in 1950s Mississippi. Maggie "the Cat" still burns hot for her ex-football star husband Brick, but he only has eyes for the bottom of a whiskey bottle. Meanwhile, Big Daddy is dying, and the family vultures are swarming for a big slice of the inheritance pie. Couched in the earthy language of the deep South, this uncompromising, intensely human portrait of a family shows why Williams is one of America's greatest playwrights. (Strong language, mature themes)

OSF Age Recommendation: Best suited for children 14 and up who can handle the mature themes.

Hamlet

Sunday, 13 June. 2:00 p.m. in the Angus Bowmer Theatre. *Something is rotten.* In Denmark, a king is dead. His brother, Claudius, has snatched the throne and the widowed queen. Life goes on—for everyone but Hamlet. The prince, fixated on his uncle as the murderer, is charged by his father's ghost to avenge the wrong. Disconnected from the foul world around him, Hamlet strains under the weight of his task. OSF's first production in a decade of Shakespeare's disturbing and psychologically rich masterpiece digs into the enigma of a man's mind.

OSF Age Recommendation: This play is suitable and highly recommended for mature 12-year-olds and up.

Henry IV, Part One

Wednesday, 16 June. 8:30 p.m. in the Elizabethan Theatre. Fit to be king? Prince Hal will be king some day, but right now he's hanging with a crowd of lowlifes, led by the round-bellied and irresistibly magnetic John Falstaff. Hal's having the time of his life, but King Henry wishes his son were more like the valiant Hotspur, head of the rebellious Percy family gunning for the throne. For Henry and his line, it's a life-or-death military struggle for England's political future. Will Hal rally to the cause and marshal leadership qualities worthy of a crown?

OSF Age Recommendation: Scenes of politics and battle alternate with comic depictions of Prince Hal's forays into petty theft and debauchery with his companions at the Boar's Head Tavern. It is suitable for children 10 and up who are able to handle the bawdiness of the Boar's Head Tavern.

FIELD TRIPS

All field trips are open to meeting registrants and their families. At least one member of a group must be registered for the meeting. Unregistered family members will be charged an additional one-time-only \$10 field trip registration fee. This fee is paid only once for this meeting, regardless of how many field trips a non-registrant participates in.

Due to limited space, advance registration was required

for all field trips. Reservation and payment of field trip fee(s) were included on the Advance Registration Form. If you didn't preregister for an excursion on which you would like to participate, inquire at the Registration Center to see whether any tickets remain.

A full refund will be granted if a trip is cancelled by the Division. If a registrant cancels via e-mail or written notification received in the Pacific Division office no later than 20 May 2010, the registrant will receive a refund of the fee(s) paid less a \$15 processing fee. If paid by credit card, an additional 3.5% of the original charge will be deducted from the amount being refunded to help pay for fees charged to the Division by credit card companies. With the exception of the Division cancelling a field trip, no refunds will be granted after 20 May.

Please note that departure times are absolute and return times are approximate. Also, all trips depart from the yellow-tagged parking lot directly in front of Science Hall.

Sunday, 13 June

Field Trip #1: Winemaking in the Rogue and Applegate Valleys, Southern Oregon. Departs from the yellow lot in front of Science Hall (labeled "Don't Park Here!!!") on the map on the inside front cover of these *Proceedings*) at 10:00 a.m.; returns about 4:00 p.m. A Pacific Division representative will be present to provide participants with meeting materials, so please arrive early! Includes transportation via vans, box lunch and any applicable fees. Cost: \$50 per person.

Organized by Dr. Steven Petrovic (Department of Chemistry, Southern Oregon University), this excursion is planned to visit three wineries in the Rogue and Applegate Valleys of southern Oregon. Included will be tours of the operations, barrel tasting of wines, and talks on how soil type, aspect and temperature control planting and irrigation practices. Participants will also be exposed to how winemakers approach winemaking for red and white varieties.

Wednesday, 16 June

Field Trip #4: Endemics of Oregon Caves National Monument. Departs from the yellow lot in front of Science Hall (labeled "Don't Park Here!!!") on the map on the inside front cover of these *Proceedings*) at 8:00 a.m.; returns about 10:00 p.m. Includes transportation via vans, box lunch and any applicable fees. Dinner is on your own at Oregon Caves. Cost: \$50 per person.

Led by Drs. Chris Oswald and Steve Cross (Department of Biology, Southern Oregon University), this excursion travels north on Interstate 5 to Grants Pass, where it turns west on Highway 199 to Cave Junction. From Cave Junction, it travels east the last 20 or so miles on Oregon Highway 26. Tours of the cave are considered moderately strenuous and are not recommended for people with heart, breathing, or walking problems. The half-mile route includes more than 500 stairs (most

of which are steep and uneven) and a total climb of 230 feet. The lowest passageway you will have to duck under is about 45 inches tall. Children must be at least 42 inches tall and be able to demonstrate their ability to climb a set of test stairs, unassisted, to go on the full tour of the cave. After our tour of the cave we will take a leisurely break to eat box lunches, followed by a hike on one of the many trails to explore the rich old-growth forest, a region recognized to be one of the most geologically unique and botanically diverse in the United States. Before leaving Oregon Caves we will have dinner at the Chateau, an historic 76 year old structure that is truly one of the great lodges of the National Parks. Dinner is on your own (entrees are priced at roughly \$20 to \$32). Following dinner we'll head back to Ashland, arriving about 10:00 p.m.

The National Monument sits at approximately 4,000 feet elevation. Daytime temperatures are likely to be cool, so come prepared! It is recommended that participants wear good hiking boots or tennis shoes in order to traverse the cave and also for the trail hike afterwards. Don't neglect the warning about the strenuous nature of hiking the cave in the paragraph above!

Thursday, 17 June

Field Trip #2: Geology of Mount Shasta. Departs from the yellow lot in front of Science Hall (labeled "Don't Park Here!!!") on the map on the inside front cover of these *Proceedings*) at 8:00 a.m.; returns about 5:00 p.m. Includes transportation via vans, box lunch, and road log. Cost: \$50 per person.

This trip, led by Dr. Robert Christiansen (USGS retired, Menlo Park, CA) will travel south from Ashland, passing through a small part of the Klamath Mountains province that represents the oldest geologic terranes of the Southern Oregon-Northern California region, to the area of Mount Shasta, one of the most active volcanoes of the Cascade Range. The Cascades, the only active volcanic arc in the conterminous U.S., were formed by subduction of the Farallon lithospheric plate, which was born along the Gorda-Juan de Fuca oceanic spreading center. Most of the Cascades arc in Oregon and California consists of relatively small shield-shaped volcanoes, each of them erupted in rather brief periods of time and consisting largely of lavas with a limited range of basalt to basaltic-andesite compositions. By contrast, relatively few of the larger volcanoes of the arc have a wide range of compositional types—mainly dacites and andesites—and are complexly evolved, long-lived stratocones that consist both of lavas and of fragmental, more explosively erupted volcanic rocks.

Mount Shasta is the largest strato-volcano of the Cascade chain. At nearly 500 km³, it is comparable in volume to such well-known volcanoes as Fuji-san (Japan) and Cotopaxi (Ecuador). The peak rises to an elevation of 4,317 m (14,162 feet), more than 3,200 m (10,500 feet) above its base, and dominates the landscape in much of northern California.

The trip will include several stops to observe the Shasta Valley, Mt. Shasta itself and a variety of geological features

associated with it. Most stops require little walking beyond exiting the vehicles. Of the eight stops planned, stop 3 requires about a half mile round trip of walking on a well marked Forest Service trail; Stop 5 requires about 100 yards of walking each way over somewhat irregular ground; and stop 6 is a little over a half-mile round trip on an unpaved road across level ground. Stop 8 offers the option of longer walks, up to a mile or so, depending on the time available at the end of the trip (before the return to Ashland), but no walking is necessary. The last two stops are on Mount Shasta at elevations of about 6200 and 7800 feet respectively.

No special equipment is needed, although good walking shoes and jackets appropriate for the elevations at the last 2 stops are desirable.

Field Trip #3: 8:00 a.m. – 5:00 p.m. Serpentine Geology and Botanical Diversity of Eight Dollar Mountain and the Illinois River Valley, Southern Oregon. Departs from the yellow lot in front of Science Hall (labeled "Don't Park Here!!!") on the map on the inside front cover of these *Proceedings*) at 8:00 a.m.; returns about 5:00 p.m. Includes transportation via vans, box lunch and any applicable fees. Cost: \$50 per person.

Organized and led by Drs. Michael Parker and Frank Lang (Department of Biology, Southern Oregon University, Ashland, OR), this trip will travel to the Illinois River Valley to explore unique and diverse plant communities in one of North America's most geologically-complex regions. From Jeffrey pine savannahs and shrublands to fens inhabited by rare, endemic orchids and carnivorous pitcher plants, we will explore the botanical riches of Eight Dollar Mountain and the scenic Illinois River corridor. We will also visit the Deer Creek Center for Field Research and Education, enjoying lunch on the patio with the spectacular panorama of the Siskiyou Mountains as a backdrop.

Note that this excursion will include short hikes over uneven ground. Sturdy walking shoes are recommended.

WORKSHOPS

Workshops are available to all meeting registrants without additional fees with the exception of Geometry as a Design Tool, for which a five dollar fee is being charged to cover materials (refer to "Geometry as a Design Tool" on page 5353 of these *Proceedings*). As with all of the technical program for this meeting, all workshop participants must be registered for the meeting. In order to help workshop developers in their planning, pre-registrants were asked to indicate their interest in attending each workshop. Some workshops have limited space. If you are concerned about whether a workshop still has room, please inquire at the Registration Center.

Descriptions of all workshops may be found starting on page 51 of these *Proceedings*.

PROGRAM AT A GLANCE

SUNDAY – 13 JUNE	MONDAY – 14 JUNE	TUESDAY – 15 JUNE	WEDNESDAY – 16 JUNE
<p><i>FIELD TRIP</i> Winemaking in the Rogue and Applegate Valleys</p> <p>10:00 AM – 4:00 PM</p>	<p><i>SYMPOSIUM</i> Materials Science and Nanotechnology Science 171</p> <p>8:10 AM – NOON</p>	<p><i>WORKSHOP</i> Science Education for New Civic Engagements and Responsibilities (SENCER) Science 225</p> <p>8:00 AM – NOON</p>	<p><i>BUSINESS MEETING</i> Business Meeting of the Council of the Pacific Division Science 171</p> <p>7:00 AM – 10:00 AM</p>
	<p><i>SYMPOSIUM</i> Recent Progress in Vaccine and Drug Development Science 275</p> <p>8:30 AM – NOON</p>	<p><i>WORKSHOP</i> Evidence-Based Research, the Science of Research Synthesis... Science 164</p> <p>8:30 AM – 4:30 PM</p>	<p><i>FIELD TRIP</i> Endemics of Oregon Caves National Monument</p> <p>8:00 AM – 10:00 PM</p>
	<p><i>CONTRIBUTED PAPERS</i> Anthropology and Archaeology Health Sciences Science 215</p> <p>8:45 AM – 11:30 AM</p>	<p><i>SYMPOSIUM</i> Science-Humanities Cross-Fertilizations Science 275</p> <p>8:30 AM – NOON</p>	<p><i>SYMPOSIUM</i> Forensic Science: A Balance of Art and Science Science 275</p> <p>8:30 AM – NOON</p>
		<p><i>SYMPOSIUM</i> Citizen Science: Integrating Biophysical and Social Realities... Science 108</p> <p>8:30 AM – 5:00 PM</p>	<p><i>WORKSHOP</i> Science and Religion: A Philosophical Look at Issues and Approaches Science 215</p> <p>8:30 AM – NOON</p>
		<p><i>SYMPOSIUM</i> Anthropological Approaches to Environmental Change Science 171</p> <p>8:30 AM – 4:50 PM</p>	<p><i>WORKSHOP</i> Geometry as a Design Tool (\$5 fee for materials) Science 067</p> <p>8:30 AM – 5:00 PM</p>
	<p><i>POSTER SESSION</i> Poster Session I Science Hall, First Floor</p> <p>NOON – 4:00 PM</p>	<p><i>CONTRIBUTED PAPERS</i> Education Chemistry and Biochemistry Science 067</p> <p>8:45 AM – NOON</p>	<p><i>NOON PUBLIC LECTURE</i> "Thinking About Forever: An Interactive Prototype for a Sustainable Educational Facility." Science 118</p> <p>12:15 PM – 1:00 PM</p>
	<p><i>NOON PUBLIC LECTURE</i> "Science Education for New Civic Engagements and Responsibilities (SENCER)" Science 118</p> <p>12:15 PM</p>	<p><i>CONTRIBUTED PAPERS</i> Ecol, Org Bio, and Env Sci Cell and Molecular Biology Science 057</p> <p>9:05 AM – 11:50 AM</p>	<p><i>SYMPOSIUM</i> Wildlife Forensics Science 275</p> <p>1:30 PM – 4:20 PM</p>
	<p><i>CONTRIBUTED PAPERS</i> Psychology Computer and Information Sciences Soc., Econ., and Pol. Sciences General and Interdisciplinary Science 215</p> <p>1:25 PM – 4:10 PM</p>	<p><i>POSTER SESSION</i> POSTER SESSION II Science Hall, First Floor</p> <p>NOON – 4:00 PM</p>	<p><i>SYMPOSIUM</i> Defended by Poets: The Role of Art in Communicating Climate Change in Our National Parks Science 171</p> <p>1:30 PM – 5:00 PM</p>
	<p><i>SYMPOSIUM</i> Science and Art Consilience Science 171</p> <p>1:30 PM – 4:50 PM</p>	<p><i>NOON PUBLIC LECTURE</i> "The Art of Biology and the Biology of Art: High Tech High Presentation of Learning" Science 118</p> <p>12:15 PM</p>	
	<p><i>WORKSHOP</i> Promoting Meaningful Learning Science 165</p> <p>1:30 PM – 5:00 PM</p>	<p><i>ORGANIZATIONAL MEETING</i> Oral Biology and Dental Medicine Section Science 164</p> <p>12:30 PM – 5:00 PM</p>	
		<p><i>PROGRAMS CONTINUING from MORNING</i> WORKSHOP: Evidence-Based Research... SYMPOSIUM: Citizen Science... SYMPOSIUM: Anthropological Approaches...</p>	<p><i>FIELD TRIP</i> Geology of Mount Shasta</p> <p>8:00 AM – 5:00 PM</p>
		<p><i>SYMPOSIUM</i> Ecotoxicology and Environmental Protection Science 275</p> <p>1:30 PM – 5:00 PM</p>	<p><i>FIELD TRIP</i> Serpentine Geology and Botanical Diversity</p> <p>8:00 AM – 5:00 PM</p>
		<p><i>WORKSHOP</i> A Discussion on the Value of Advanced Placement Programs Science 215</p> <p>1:30 PM – 5:00 PM</p>	
			THURSDAY – 17 JUNE
<p><i>EVENING PLENARY SESSION</i> "Panel Discussion about the Science-Art Exhibit" Meese Auditorium (Art Building)</p> <p>6:45 PM</p>	<p><i>EVENING PLENARY LECTURE</i> "Frontiers in Ecological Theory: The Role of Wolves as Keystone Predators" Science 118</p> <p>7:00 PM</p>	<p><i>STUDENT AWARDS BANQUET</i> Rogue River Room Stevenson Union</p> <p>6:00 PM</p>	
<p><i>SCIENCE-ART EXHIBIT OPENING RECEPTION</i> Foyer, Art Building</p> <p>8:00 PM</p>	<p><i>SOU PRESIDENT'S RECEPTION</i> Foyer, Science Hall</p> <p>8:00 PM</p>	<p><i>PACIFIC DIVISION PRESIDENT'S LECTURE</i> "Restoring the Urban Jungle: If You Build It, Will They Come?" Rogue River Room (Stevenson Union)</p> <p>APPROX 8:15 PM</p>	

	Agriculture and Horticultural Sciences	Anthropology	Biology, Cell and Molecular	Biology, Organismal	Chemistry and Biochemistry	Computer and Information Sciences	Earth Sciences	Ecology	Education	Environmental Sciences	Evolution	General and Interdisciplinary	Health Sciences	Industrial Science and Technology	Mathematics	Physics and Materials Sciences	Psychology	Science Policy	Social Sciences	
Interest Matrix																				
This interest matrix is designed to help individuals identify programs of interest. It is by no means exhaustive, nor is it absolutely authoritative. We encourage attendees to explore as many of the different programs as their time and interests allow.																				
The numbers following the titles of programs identify the pages on which the programs may be found in these Proceedings.																				
Synopsis:																				
Monday																				
Materials Science and Nanotechnology (41)																				
Recent Progress in Vaccines and Drug Development (42)																				
Science and Art Consilience (42)																				
Tuesday																				
Science-Humanities Cross-Fertilizations (44)																				
Citizen Science: Integrating Biophysical and Social Realities in the Mgmt of the Ashland Watershed (44)																				
Anthropological Approaches to Environmental Change (45)																				
Ecotoxicology and Environmental Protection (47)																				
Wednesday																				
Forensic Science: A Balance of Art and Science (48)																				
Wildlife Forensics (48)																				
Defended by Poets: The Role of Art in Communicating Climate Change in Our National Parks (49)																				
Contributed Paper Sessions:																				
Monday																				
Morning Joint Session (55)																				
Afternoon Joint Session (55)																				
Tuesday																				
Morning Joint Session I (57)																				
Morning Joint Session II (57)																				
Contributed Poster Sessions:																				
Monday (59)																				
Tuesday (62)																				
Workshops:																				
Monday																				
Promoting Meaningful Learning (51)																				
Tuesday																				
Science Education for New Civic Engagements and Responsibilities (SENCER) 52																				
Evidence-Based Rsrch, the Sci of Rsrch Synthesis: Implications and Applications in the Delivery of Health Care (52)																				
A Discussion on the Value of Advanced Placement Programs from High School and University Perspectives (52)																				
Wednesday																				
Geometry as a Design Tool (53)																				
Science and Religion: A Philosophical Look at Issues and Approaches (53)																				

GENERAL SESSIONS

Sunday, 13 June 2010

SCIENCE-ART EXHIBIT* OPENS

The science-art exhibit, a special program for this meeting, opens today and runs through early September in the following venues:

Stevenson Union Gallery
Hannon Library Galleries
Center for Visual Arts (CVA) Galleries

SALMON BAKE

Patio in front of Science Hall

Sunday
4:15 p.m.

Sponsored by the Native American Student Union, drumming is set to begin at 4:15 p.m., with the meal to follow at about 4:30 p.m. Please refer to page 31 of these *Proceedings* for more information.

EVENING PLENARY PROGRAM*

Meese Auditorium, Art Building

Sunday
6:45 p.m.

The program this evening will be a panel discussion of a variety of topics surrounding the science-art exhibit which opened on campus today. The discussion will bring together scientists, humanists, curators, and artists to discuss some core issues implicit in the exhibit.

SCIENCE-ART EXHIBIT OPENING RECEPTION*

Art Building

Sunday
8:00 p.m.

Sponsored by the Pacific Division, this informal reception features soft drinks, beer and chips. It begins immediately following the conclusion of the panel program and continues until about 9:15 p.m. All registrants and their families are invited to enjoy the conviviality of this event. Please wear your registration badge.

Monday, 14 June 2010

NOON PUBLIC LECTURE*

Science 118

Monday

12:15 p.m. - 1:00 p.m.

1 *Science Education for New Civic Engagements and Responsibilities (SENCER)*, **AMY SHACHTER** (Santa Clara University, Santa Clara, CA). A workshop on SENCER will be presented on Tuesday morning (refer to page 51 of these *Proceedings*).

EVENING PLENARY LECTURE*

Science 118

Monday

7:00 p.m.

2 *Frontiers in Ecological Theory: The Role of Wolves as Keystone Predators*, **CRISTINA EISENBERG** (Oregon State University, Corvallis, OR).

SOU PRESIDENT'S RECEPTION

Schneider Museum of Art

Monday

8:00 p.m.

Southern Oregon University President Dr. Mary Cullinan will host an informal reception following Ms. Eisenberg's talk. All participants and their families are invited to enjoy this relaxed occasion. Non-registered family members are welcome, but must be accompanied by a registrant. Please wear your registration badge.

*The public is invited to attend this program at no charge.

GENERAL SESSIONS

Tuesday, 15 June 2010

NOON PUBLIC LECTURE*

Science 118
Tuesday
12:15 p.m.

3 *The Art of Biology and the Biology of Art: High Tech High Presentation of Learning*, **JAY VAVRA** (High Tech High, San Diego, CA).

ORGANIZATIONAL MEETING

for the

ORAL BIOLOGY and DENTAL MEDICINE

SECTION

Science 164
Tuesday
12:30 p.m.

If you are interested in helping to launch this new Pacific Division Section, please plan to attend this meeting. Francesco Chiappelli, chair of the section, will be the convenor.

RECEPTION and STUDENT AWARDS BANQUET

Rogue River Room, Stevenson Union
Tuesday
6:00 p.m.

Beginning at 6:00 p.m., a hosted reception will feature soft drinks and juices. Dinner will be served around 6:45 p.m. Be sure to bring your dinner ticket with you, as it is needed to not only verify that you are on our dinner list but also to let the servers know your choice of entrée. Tickets to the banquet cost \$30 and needed to be purchased in advance. Students in competition for Awards of Excellence were invited to attend the banquet as guests of the Division by requesting a ticket in advance (at no charge). If you do not have a ticket but would like to attend the banquet, please check at the Registration Center to see if any tickets remain. Following dinner will be the announcement of the winners of the student Awards of Excellence. *Student award winners are asked to stay until the end of the program so that photographs may be taken of the group.* After announcement of the award winners, Dr. John Hafernik (San Francisco State University, San Francisco, CA) will present the Presidential Lecture, "Restoring the Urban Jungle: If You Build It Will They Come?" The evening should end by 9:30 p.m.

*The public is invited to attend this program at no charge.

Wednesday, 16 June 2010

MEETING of the COUNCIL of the PACIFIC DIVISION

Science 171
Wednesday
7:00 a.m. - 10:00 a.m.

The Council of the AAAS, Pacific Division will hold its annual breakfast business meeting starting at 7:00 a.m. in Science 171. The Council will elect officers, discuss programs for the 2011 and 2012 annual meetings, and transact such other business as is required by the Division's By-laws.

NOON PUBLIC LECTURE*

Science 118
Wednesday
12:15 p.m.

5 *Thinking About Forever: An Interactive Prototype for a Sustainable Educational Facility*, **BILL WIECKING** (Hawai'i Preparatory Academy, Kamuela, HI).

TECHNICAL SESSIONS

1100 (time italicized and underlined) identifies a student presentation

* identifies the speaker from among several authors listed

63 (bolded number) is the abstract number

I. SYMPOSIA

Monday, 14 June 2010

Sixth Annual Symposium on Materials Science and Nanotechnology

Sc 171

Monday

8:10 a.m. – 12:00 p.m.

Program organizers: *Panos Photinos, Ellen Siem* (Department of Chemistry, Physics, Materials Science and Engineering, Southern Oregon University, Ashland, OR) and *Shalini Prasad* (Department of Electrical and Computer Engineering, Portland State University, Portland, OR)

Program sponsored by the Pacific Division section on Physics and Materials Science

Session Chair: *Shalini Prasad and Panos Photinos*

8:10 *Introductory Comments*

8:20 **6** *A Novel Thermoelectric High Vacuum Cryo-stage*, **JUSTIN HAYNES, MICHAEL WORKMAN, and PETER K. WU** (Department of Physics, Southern Oregon University, Ashland, OR).

8:40 **7** *The Effects of Thermo-mechanical Processes and PH on the Corrosion Behavior of AA6111 Aluminum Auto Panels*, **MATTHEW A. FLOYD* and GEORGE K. QUAINOO** (Department of Physics, Materials and Engineering, Southern Oregon University, Ashland, OR).

9:00 **8** *Corrosion Behavior of Aluminum AA6611 under Varying Conditions of Cold Work, Artificial Aging, and pH*, **TYLER L. FOWLER* and GEORGE K. QUAINOO** (Department of Physics, Materials Science and Engineering, Southern Oregon University, Ashland, OR).

9:20 **9** *Iridium Oxide Nanomonitors: Clinical Diagnostic Devices for Health Monitoring Systems*, **SHALINI PRASAD¹, ³* VINU VENKATRAMAN¹, RAVIKIRAN REDDY¹, FENGYAN ZHANG², DAVID EVANS², and BRUCE ULRICH²** (¹Portland State University, Portland OR; ²Sharp Labs of America Inc,

Camas WA; ³Arizona State University, Tempe AZ).

9:40 **10** *Quantum Mechanics of Cation Transport*, **DAVID BLACKMAN** (Retired, UC Berkeley Physics, Phoenix, OR).

10:00 BREAK

10:20 **11** *Electrochemical Sensors for Neurodegenerative Disease Detection*, **GAURAV CHATTERJEE^{1*}, SRIVATSA AITHAL¹, CLAIRE McGRAW², SRINATH KASTURI-RANGAN², MICHAEL SIERKS² and SHALINI PRASAD^{1,3}** (¹Department of Electrical, Computer and Energy Engineering, Arizona State University, Tempe, AZ; ²Department of Chemical Engineering, Arizona State University, Tempe, AZ; ³Department of Electrical and Computer Engineering, Portland State University, Portland, OR).

10:40 **12** *Apertureless Near-field Two-Photon Fluorescence Imaging with Continuous Wave Excitation*, **DEREK B. NOWAK^{1*}, A.J. LAWERNCE¹, and ERIK J. SÁNCHEZ^{1,2}** (¹Department of Physics, ²Department of Electrical and Computer Engineering, Portland State University, Portland, OR).

11:00 **13** *Four Current Diverse Cosmological Anomalies and Their Common Cause*, **ROGER ELLMAN** (The-Origin Foundation, Inc., Santa Rosa, CA).

11:20 **14** *The Inside Track on Galactic Spiral Arms*, **ERIK ANDERSON** (Ashland, OR).

11:40 **15** *Dynamic Phase Diagram of the Semi-dilute CPyCl/NaSal Micellar System*, **PANOS PHOTINOS** (Department of Chemistry, Physics, Materials and Engineering, Southern Oregon University, Ashland, OR).

See also poster numbers 134 and 135, presented in Poster Session II (refer to page 62 of these *Proceedings*) on Tuesday from 12:00 p.m. – 4:00 p.m.

Progress in Vaccine and Drug Development

Science 275

Monday

8:30 a.m. – 12:00 p.m.

Program organizer: *Kenneth Cornell* (Department of Chemistry and Biochemistry, Boise State University, Boise, ID)

Program sponsored by the Pacific Division section on Cell and Molecular Biology

In this symposium, investigators will present research on the synthesis and testing of therapeutic drugs, development of drug delivery platforms, and identification of drug targets for a variety of human and animal diseases. As well, presentations will include research into the identification and production of vaccine antigens, and development and testing of vaccines and vaccine delivery paradigms to stimulate protective immunity to treat infectious disease and cancer

Session Chair: *Ken Cornell*

8:30 *Introductory Comments*

8:40 **16** *Construction and Characterization of an IsdA-Cholera Toxin A/B Chimera for Use as a Potential Intranasal *Staphylococcus aureus* Vaccine*, **JULIETTE K. TINKER^{1*}** and **BRITNI M. ARLIAN²** (¹Department of Biological Sciences, Boise State University, Boise, ID; ²Department of Biology, The College of Idaho, Caldwell, ID).

9:10 **17** *Oncostatin M as a Potential Target for Inhibiting Breast Cancer Metastasis*, **CHERYL L. JORCYK** (Department of Biological Sciences, Boise State University, Boise, ID).

10:30 **18** *Role Of Monocyte Chemoattractant Protein (MCP)-1 During Liver Regeneration*, **KRISTEN A. MITCHELL** (Department of Biological Sciences, Boise State University, Boise, ID).

10:10 BREAK

10:30 **19** *DockOmatic: Automating Autodock for Ligand to Receptor Binding Prediction*, **OWEN M. MCDUGAL*** and **REED B. JACOB** (Department of Chemistry and Biochemistry, Boise State University, Boise, ID).

11:00 **20** *Possible Requirement for Borrelia burgdorferi protein(s) Encoded within the bba01-bba07 Region of lp54 in Establishing Mammalian Infection by Tick Bite*, **AARON BESTOR***, **PHILIP E. STEWART**, **MOLLIE W. JEWETT**, **AMIT SARKAR** and

PATRICIA A. ROSA (Laboratory of Zoonotic Pathogens, Rocky Mountain Laboratories NIH/NIAID, Hamilton, MT).

11:30 **21** *Metabolic and Proteomic Analyses of MTN Deficiency Reveal Potential Mechanisms of Action and Targets for Antibiotic Development*, **KEN CORNELL***, **SETH EIDEMILLER**, **TONY MARTINEZ**, and **OWEN MCDUGAL** (Department of Chemistry and Biochemistry, Boise State University, Boise, ID).

Science and Art Consilience

Science 171

Monday

1:30 p.m. – 4:50 p.m.

Program organizer: *John Sollinger* (Department of Biology, Southern Oregon University, Ashland, OR)

Program sponsored by the Pacific Division sections on Ecology, Organismal Biology and Environmental Sciences, and General and Interdisciplinary Studies

Fifty years after C.P. Snow's famous "two cultures" lecture, there is a movement to bridge the divide between art and science with an intellectual borderland where their shared creativity and quest for discovery can be synergized. The patterns, harmonies, symbols, and perceptions that are shared across borders and disciplines, where knowledge and wisdom unite, define a new way of thinking, teaching and learning. This paradigm shift serves to spark extraordinary creativity and inspiration for students, educators and researchers. Presenters from various disciplines will relate how they fuse science and art, leading to new insights and models in their research and teaching.

Session Chair: *John Sollinger*

1:30 *Welcome and Overview*

1:35 **22** *Living and Learning in the Intellectual Borderland (Part 1)*, **DIANE E. ULLMAN^{1*}** and **DONNA BILLICK²** (¹Professor of Entomology, Co-Founder and Co-Director of the UC Davis Art/Science Fusion Program, Associate Dean for Undergraduate Academic Programs, College of Agricultural and Environmental Sciences, Office of the Dean, University of California Davis, Davis, CA; ²Co-Founder and Co-Director of the UC Davis Art/Science Fusion Program, Program Representative, Department of Plant Pathology, University of California Davis, Davis, CA, Owner and Director of Billick Rock Art, Board of Directors for Tile Heritage Foundation. Owner and Director of Todos Artes, Baja Mexico).

- 2:00 23** *Living and Learning in the Intellectual Borderland (Part 2)*, **DONNA BILLICK^{1*} and DIANE E. ULLMAN²** (¹Co-Founder and Co-Director of the UC Davis Art/Science Fusion Program, Program Representative, Department of Plant Pathology, University of California Davis, Davis, CA, Owner and Director of Billick Rock Art, Board of Directors for Tile Heritage Foundation, Owner and Director of Todos Artes, Baja Mexico; ²Professor of Entomology, Co-Founder and Co-Director of the UC Davis Art/Science Fusion Program, Associate Dean for Undergraduate Academic Programs, College of Agricultural and Environmental Sciences, Office of the Dean, University of California Davis, Davis, CA).
- 2:25 24** *Art and Science: Bridging the Two Cultures through Photography*, **TERRENCE R. NATHAN** (Atmospheric Science Program, Department of Land, Air and Water Resources, University of California Davis, Davis, CA).
- 2:50 BREAK**
- 3:10 25** *How They Learned Science By Singing About It*, **WENDY K. SILK** (Department of Land Air and Water Resources, University of California at Davis, Davis CA).
- 3:35 26** *Creativity: The Nexus of Art and Science*, **ANN E. SAVAGEAU** (Design Department, University of California Davis, Davis, CA).
- 4:00 27** *Windows Into the Unimaginable*, **CATHERINE CHALMERS** (Independent Artist, New York, NY).
- 4:25 28** *Science and the Arts: Rethinking the Liberal Arts Curriculum*, **PRAKASH R. CHENJERI** (Department of Language, Literature, and Philosophy, Southern Oregon University, Ashland, OR).

Tuesday, 15 June 2010

Science-Humanities Cross-Fertilizations

Science 275
Tuesday
8:30 a.m. – 12:00 p.m.

Program organizers: *Robert L. Chianese* (California State University, Northridge, CA) and *Carl A. Maida* (University of California, Los Angeles, CA)

Program sponsored by the Pacific Division section on General and Interdisciplinary Studies

Session Chair: *Robert L. Chianese*

8:30 *Introductory Comments*

8:40 **29** *Something the Sun Suck'd Up: Malaria as Portrayed in Shakespeare*, **BARBARA YABLON MAIDA** (Department of Geography, University of California, Los Angeles, CA).

9:10 **30** *Training for Life: Dewey, Experimentalism, and the Great Transformation in Schooling*, **CARL A. MAIDA** (University of California, Los Angeles, CA).

9:40 **31** *The Wildman: Representation of An Archetype in Popular Perception*, **D. JEFFREY MELDRUM** (Department of Biological Sciences, Idaho State University, Pocatello, ID).

10:10 BREAK

10:30 **32** *Evolution and the Fate of Humanity*, **LAWRENCE H. WOOD** (Physicist, Retired, Lacey, WA).

11:00 **33** *Art and Ecology in Jonathan Fisher's A Morning View of Blue Hill Village 1824: "The Full Adjusted Harmony of Things,"* **ROBERT LOUIS CHIANESE** (California State University, Northridge, CA).

11:30 **34** *Does Art Matter, and If So, Why? An Artist Turns to an Ethnologist for the Answers*, **SHOSHANAH DUBINER** (Ashland, OR).

Citizen Science: Integrating Biophysical and Social Realities in the Management of the Ashland Watershed

Science 108
Tuesday
8:30 a.m. – 5:00 p.m.

Program organizers: *Mark A. Shibley* (Department of Environmental Studies, Southern Oregon University, Ashland, OR) and *Marty Main* (Small Woodland Services, Inc., Ashland, OR)

Program sponsored by the Pacific Division Sections on Ecology, Organismal Biology, and Environmental Sciences, Social, Economic and Political Sciences

The Ashland Watershed is a 15,000 acre watershed that provides water for the City of Ashland. Located in steep, highly erosive topography, the watershed contains a large, relatively unmanaged forest ecosystem with a number of critical values, including late successional forests and high populations of older forest-dependent species such as fishers and northern spotted owls. It is also a highly diverse ecosystem, ranging from 2,000 to 7,000 feet elevation and 20 to 60 inches of annual precipitation in just 9 linear miles. Located in the dry eastern end of the Klamath-Siskiyou province, the area is at elevated risk of uncharacteristic high severity disturbance from insects, disease, and especially fire. A unique arrangement of citizen involvement and community collaboration resulted in the development of a "Community Alternative" that ultimately was largely accepted by the US Forest Service as the preferred alternative for their Ashland Forest Resiliency Project. The AFR project plans to implement ecologically sensitive forest and resource management activities to improve the long-term resiliency of the forest ecosystem, while minimizing the potential for high severity disturbance. AFR will be implemented, beginning in 2010, through a unique partnership between the US Forest Service, the City of Ashland, The Nature Conservancy, and Lomakatsi Restoration Project, a local forest restoration company. This symposium will explore the diverse biophysical and social realities that are producing a unique approach to land and resource management in the Ashland Watershed.

8:30 *Welcome*, **ALISSA ARP** (Dean, College of Arts and Sciences, Southern Oregon University, Ashland, OR)

8:40 *Introduction – Integration and Collaboration*, **MARTY MAIN** (Small Woodland Services, Inc., Ashland, OR) and **MARK SHIBLEY** (Department of Environmental Studies, Southern Oregon University, Ashland, OR)

Biophysical Realities in the Ashland Watershed

Moderator: *Marty Main*

9:00 **35** *Functionality of the Siskiyou Mountain Ecosystem*, **THOMAS ATZET** (Atzet Ecological Consulting, Merlin, OR).

9:20 36 *Fire History of the Ashland Watershed*, **THOMAS SENSENIG** (Southwest Oregon Area Ecologist USFS, Medford Interagency Office, Medford OR).

9:40 37 *Wildlife Response to Fuels Reduction Activities Research in the Ashland Watershed*, **DAVID CLAYTON** (Forest Wildlife Biologist, Rogue River-Siskiyou National Forest, Medford, OR).

10:00 38 *Economic Valuation of Forested Watersheds and Applicability to the Ashland Forest Resiliency Project*, **JOHN J. GUTRICH** (Department of Environmental Studies, Southern Oregon University, Ashland, OR).

10:20 39 *US Forest Service Role in Integrating Biophysical Realities: The Ashland Forest Resiliency Stewardship Project*, **DON BOUCHER** (Siskiyou Mountains Ranger District, Ashland, OR).

10:40 DISCUSSION

11:15 LUNCH

Multi-party Monitoring and Community Engagement in the Ashland Forest Resiliency Project

Moderator: *Mark Shibley*

12:15 40 *Forest and Resource Management in the Ashland Watershed: The Historical Context*, **MARTY MAIN** (Small Woodland Services, Inc., Ashland, OR).

12:35 41 *Multi-Party Monitoring to Build Community Support for AFR*, **DARREN BORGHIAS** (The Nature Conservancy, Medford, OR).

12:55 42 *What did we learn?: An Assessment of AFR's Summer 2009 Multi-party Monitoring Process*, **MARK A. SHIBLEY** (Department of Environmental Studies, Southern Oregon University, Ashland, OR).

1:15 43 *Community Engagement in the Ashland Forest Resiliency Project*, **CHRIS CHAMBERS** (Ashland Fire and Rescue, Ashland OR).

1:35 44 *AFR Stewardship Project: Developing Implementation Capacity through Workforce Training Programs*, **MARKO BEY** (Lomakatsi Restoration Project, Ashland, OR).

1:55 DISCUSSION

2:30 BREAK

Managing Biophysical and Social Realities: Lessons for AFR from Elsewhere

Moderator: *Victoria Sturtevant*

2:45 45 *A Broad Look at Multi-party Monitoring and Community Collaboration*, **VICTORIA STURTEVANT** (Department of Environmental Studies, Southern Oregon University, Ashland, OR).

3:05 46 *Needing Conflict for Fire Resiliency*, **JOEL T. KING** (District Ranger, Wild Rivers Ranger District, Rogue River-Siskiyou National Forest).

3:25 47 *Collaborative Design: Indicators and Landscape Assessments as a Means Toward Forest Restoration*, **GEORGE MCKINLEY** (Coordinator, Southern Oregon Small Diameter Collaborative, Ashland, OR).

3:45 48 *Public Land Management for Community Health, How Far Do We Go?* **KEVIN PREISTER** (Center for Social Ecology and Public Policy, Ashland, OR).

4:05 49 *Integrating Science, Policy, and Local Knowledge*, **RICHARD A. WHITLEY** (Living Systems Consulting, Ashland, OR).

4:25 DISCUSSION

Anthropological Approaches to Environmental Change

Science 171

Tuesday

8:30 a.m. – 4:50 p.m.

Program organizers: *Stephen R. Frost* and *Frances J. White* (Department of Anthropology, University of Oregon, Eugene, OR)

Program sponsored by the Pacific Division section on Anthropology and Archaeology

This symposium examines the responses of organisms to changes in their environment. Speakers include specialists from the fields of human biology, evolutionary psychology, primatology, and paleontology, all of which focus on different, but related aspects of how organisms interact with their environments. We are interested in the environment broadly conceived to include the physical, biological, and social context within which organisms must function. Different specialists will focus on different types and levels of response from behavioral and phenotypic plasticity within the lifespan of individual organisms, to cultural change, and to adaptation over

evolutionary time scales.

Session Chair: *Stephen R. Frost*

8:30 *Introductory Comments*

8:40 **50** *Female Reproduction History and Bone Health among Shuar and Colonos from the Ecuadorian Amazon: A Life History Theory Perspective*, **FELICIA C. MADIMENOS**^{1,2*}, **J. JOSH SNODGRASS**^{1,2}, **AARON D. BLACKWELL**^{1,2,3}, **MELISSA A. LIEBERT**^{1,2}, and **LAWRENCE S. SUGIYAMA**^{1,2,3} (¹Department of Anthropology, ²Institute of Cognitive and Decision Sciences, University of Oregon, Eugene, OR; ³Center for Evolutionary Psychology, University of California, Santa Barbara, CA).

9:10 **51** *Effects of Diet and Household Economy on Growth and Health of Indigenous Shuar of Ecuadorian Amazonia*, **JULIA G. RIDGEWAY**^{1,2*}, **LAWRENCE S. SUGIYAMA**^{1,2,3}, **J. JOSH SNODGRASS**^{1,2}, **AARON D. BLACKWELL**^{1,2,3}, **FELICIA C. MADIMENOS**^{1,2}, and **MELISSA A. LIEBERT**^{1,2} (¹Department of Anthropology, ²Institute of Cognitive and Decision Sciences, University of Oregon, Eugene, OR; ³Center for Evolutionary Psychology, University of California, Santa Barbara, CA).

9:40 **52** *The Effects of Market Integration on Blood Pressure, Glucose, Cholesterol, and Triglyceride Levels in an Indigenous Lowland Ecuadorian Population*, **MELISSA A. LIEBERT**^{1,2*}, **J. JOSH SNODGRASS**^{1,2}, **AARON D. BLACKWELL**^{1,2,3}, **FELICIA C. MADIMENOS**^{1,2}, and **LAWRENCE S. SUGIYAMA**^{1,2,3} (¹Department of Anthropology, ²Institute of Cognitive and Decision Sciences, University of Oregon, Eugene, OR; ³Center for Evolutionary Psychology, University of California, Santa Barbara, CA).

10:10 BREAK

10:30 **53** *Body Composition and Lifestyle Correlates of Stress Biomarkers among Latino Immigrants in Oregon*, **ERICA C. MIDTTVEIT**^{1*}, **HEATHER H. McCLURE**^{1,2}, **J. JOSH SNODGRASS**¹, **THOMAS W. McDADE**³, **CHARLES R. MARTINEZ**², **J. MARK EDDY**², **ROBERTO A. JIMENEZ**⁴, and **LAURA E. ISIODIA**⁴ (¹Department of Anthropology, University of Oregon, Eugene, OR; ²Oregon Social Learning Center, Eugene, OR; ³Department of Anthropology, Northwestern University, Evanston, IL; ⁴Farmworker Housing Development Corporation, Woodburn, OR).

11:00 **54** *Autoimmune Thyroid Disorders as a Consequence of Cold Adaptation among the Yakut of Siberia*, **TARA J. CEPON**^{1*}, **J. JOSH SNODGRASS**¹, **WILLIAM R. LEONARD**², **LARISSA A. TARSKAIA**^{3,4}, **T.M. KLIMOVA**⁵, and **V.G. KRIVOSHAPKIN**⁵ (¹Department of Anthropology, University of Oregon, Eugene, OR; ²Department of Anthropology, Northwestern University, Evanston, IL; ³Department of Anthropology, University of Kansas, Lawrence, KS; ⁴Institute for Molecular Genetics, Russian Academy of Medical Sciences, Moscow, Russia; ⁵FSRI Institute of Health, Republic of Sakha/Yakutia, Yakutsk, Russia).

11:30 **55** *Ecological Correlates of Dental Eruption in Haplorhines*, **EMILY H. GUTHRIE**^{1*}, **KATERINA HARVATI**^{2,3}, and **STEPHEN R. FROST**¹ (¹Department of Anthropology, University of Oregon, Eugene, OR; ²Department of Early Prehistory and Quaternary Ecology, Eberhard Karls University of Tübingen, Germany; ³Senckenberg Center for Human Evolution and Paleoecology, Eberhard Karls University of Tübingen, Germany).

12:00 LUNCH

1:30 **56** *Sexual Selection for Sex Differences in Bonobo Locomotor Strategies: Implications for Interpretations of Ardipithecus*, **INDIA R. MINTON**^{*} and **FRANCES J. WHITE** (Department of Anthropology, University of Oregon, Eugene, OR).

2:00 **57** *Locomotor Anatomy and Behavior of Captive *Pan paniscus**, **D.R. BOLTER**^{1*} and **A.L. ZIHLMAN**² (¹Modesto College, Modesto, CA; ²University of California, Santa Cruz, CA).

2:30 **58** *Hylobatid Locomotor Anatomy and Evolutionary History*, **A.L. ZIHLMAN**^{1*}, **C. UNDERWOOD**¹, and **A. MOOTNICK**² (¹University of California, Santa Cruz, CA; ²Gibbon Conservation Center, Santa Clarita, CA).

3:00 BREAK

3:20 **59** *The Importance of Bonobos to Evolutionary Models of Human Social Behavior: Ecological Correlates of Female Bonding, No Infanticide, and or Lethal Raiding*, **FRANCES J. WHITE**^{*}, **MICHEL T. WALLER**, **INDIA R. MINTON**, **ROSS L. TINDALE**, and **KLAREE J. BOOSE** (Department of Anthropology, University of Oregon, Eugene, OR).

3:50 **60** *Evolution of the Theropithecus oswaldi Lineage*

Through 3 Myr of Global Climatic Change, **STEPHEN R. FROST**^{1*}, **EMILY H. GUTHRIE**¹, and **ERIC DELSON**^{2,3} (¹Department of Anthropology, University of Oregon, Eugene, OR; ²Department of Vertebrate Paleontology, American Museum of Natural History, New York, NY; ³Department of Anthropology, Lehman College, CUNY, Bronx, NY).

- 4:20 61** *The Effects of Economic Development and Lifestyle Change on Cardiovascular Health among an Indigenous Circumpolar Population*, **J. JOSH SNODGRASS**¹, **WILLIAM R. LEONARD**², **LARISSA A. TARSKAIA**³, **TARA J. CEPON**^{1*}, **T.M. KLIMOVA**⁴ and **V.G. KRIVOSHAPKIN**⁴ (¹Department of Anthropology, University of Oregon, Eugene, OR; ²Department of Anthropology, Northwestern University, Evanston, IL; ³Department of Anthropology, University of Kansas, Lawrence, KS, and Institute for Molecular Genetics, Russian Academy of Medical Sciences, Moscow, Russia; ⁴FSRI Institute of Health, Republic of Sakha/Yakutia, Yakutsk, Russia).

Ecotoxicology and Environmental Protection

Science 275

Tuesday

1:30 p.m. – 5:00 p.m.

Program Organizer: *Chris Oswald* (Department of Biology, Southern Oregon University, Ashland, OR)

Sponsored by the Pacific Division section on Ecology, Organismal Biology and Environmental Science

This symposium focuses on the ways in which ecotoxicology as a discipline can help promote both specific knowledge of particular environmental hazards, and general understanding of ecology and physiology. The field of ecotoxicology is an excellent tool for educating the public on the importance of environmental protection. The concept of direct effects of toxins on organisms provides a readily understood and appreciated starting point. The complex means by which toxins exert their deleterious effects are less familiar – ecosystem processes, trophic structure, community relationships, life history trait variation, biotransformation, etc. Lack of understanding of these important biological principles contributes in large part to the unwillingness of the public and policy makers to alter environmentally harmful practices. This symposium explores how communication of the findings of ecotoxicological research can be used to promote improved understanding of biological processes as well as specific risks associated with particular pollutants. Participants will present their research findings in this context, and discuss ways to get their message to the public. We will seek to identify biological concepts that are key to understanding the importance of environmental protection, and develop a framework for communicating these concepts within ecotoxicology.

Session Chair: *Chris Oswald*

1:30 *Introductory Comments*

- 1:40 62** *Ecotoxicology and Endangered Species*, **SCOTT HECHT** (National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources, Endangered Species Division, Lacey, WA).

- 2:20 63** *A Mechanistic Approach to the Evaluation of Pesticide Risks to Aquatic Species Native to the Pacific Northwest*, **JEFFREY J. JENKINS** (Department of Environmental and Molecular Toxicology, Oregon State University, Corvallis, OR).

3:00 BREAK

- 3:20 64** *Landscape Risk Assessment as a Science-Policy Integrative Tool for Environmental Management*, **W.G. LANDIS***, **K.K. AYRE** and **A.J. MARKIEWICZ** (Institute of Environmental Toxicology, Huxley College of the Environment, Western Washington University, Bellingham, WA).

- 4:00 65** *Barriers to Sound Science-based Environmental Policy: Public Misconceptions Regarding Ecological and Physiological Processes*, **CHRISTINE OSWALD** (Department of Biology, Southern Oregon University, Ashland, OR).

4:30 *Discussion*

Wednesday, 16 June 2010

**Forensic Science:
A Balance of Art and Science**

Science 275
Wednesday
8:30 a.m. – 12:00 p.m.

Program organizer: *Mary Carrabba* (Department of Chemistry, Southern Oregon University, Ashland, OR)

Program sponsored by the Pacific Division Section on General and Interdisciplinary Studies

Forensic science is the application of science to address legal inquiries related to civil or criminal activity in an effort to establish the authenticity of an artifact or event. In its application, forensic science typically utilizes many focused scientific disciplines, such as chemistry and biology. However, nonscientific disciplines, including art, are important elements of forensic analysis. This first session of a two-part symposium (see #2 below) will seek to explore the many ways art is encountered in the field of forensic science, from detailed images viewed through a light microscope to the tell-tale details in a piece of artwork suspected of being a forgery.

Session Chair: *Mary Carrabba*

8:30 *Introductory Comments*

8:35 66 *Ivory Identification at the National Fish and Wildlife Forensics Laboratory*, **MARGARET E. "COOKIE" SIMS** (National Fish and Wildlife Forensics Laboratory, Ashland, OR).

9:20 67 *Amazonian Feather Art in the Forensic Context*, **PEPPER W. TRAIL** (National Fish and Wildlife Forensics Laboratory, Ashland, OR).

9:45 BREAK

10:05 68 *Use of X-ray Microanalysis and Infrared Microspectroscopy for Multianalytical Characterization of the Walters Codex, an Ethiopian Manuscript*, **NATASJA A. SWARTZ and TAMI LASSETER CLARE** (Department of Chemistry, Portland State University, Portland, OR).

10:30 69 *Uncovering Mysteries of a Chinese Burial Relic*, **TAMI LASSETER CLARE** (Department of Chemistry, Portland State University, Portland, OR).

11:15 70 *The Art of Raman and Raman of Art: A Powerful Technique to Direct Art Restoration and the Identification of the Real and Fake*, **ANDREW WHITLEY** (HORIBA Scientific, Edison, NJ).

Wildlife Forensics

Science 275
Wednesday

1:30 p.m. – 4:20 p.m.

Program organizer: Peter Schroeder (Department of Biology, Southern Oregon University, Ashland, OR)

Program sponsored by the Pacific Division section on Ecology, Organismal Biology, and Environmental Sciences

Ashland, Oregon, the host city of the 91st Annual AAASPD Meeting, is home to the only federal wildlife forensic laboratory in the world. This second session of a two-part symposium (see #1 above) will center on either wildlife forensic science as conducted in the U.S. National Fish and Wildlife Forensic Laboratory or selected presentations on different disciplines encountered in a more typical crime laboratory.

Session Chair: *Peter Schroeder*

1:30 *Introductory Comments*

1:40 71 *Numbering the Dead: Techniques for Determining the Minimum Number of Individuals Represented by Feathers and Other Bird Remains*, **PEPPER W. TRAIL** (National Fish and Wildlife Forensics Laboratory, Ashland, OR).

2:20 72 *Forensic Identification of Black Coral*, **EDGARD ESPINOZA, MIKE SCANLAN, PAMELA McCLURE*, and BARRY BAKER** (USFWS National Fish and Wildlife Forensics Laboratory, Ashland, OR).

2:40 73 *Forensic Identification of Bald and Golden Eagles using Nuclear DNA Markers*, **MARY K. BURNHAM-CURTIS** (National Fish and Wildlife Forensics Laboratory, U.S. Fish and Wildlife Service, Ashland, OR).

3:00 BREAK

3:20 74 *Utility of Short Tandem Repeat (STR) Markers for Forensic Application in Gemsbok (*Oryx gazella*)*, **BRIAN C. HAMLIN*, STEVEN R. FAIN, JOE ZOLINE-BLACK and JAKE C. MINER** (USFWS NFWFL, Ashland, OR).

3:40 75 *Species Identification of Ivory Source*, **ROBERT M. HOESCH* and STEVEN R. FAIN** (U.S. Fish and Wildlife Forensics Laboratory, Ashland, OR).

4:00 76 *Mitochondrial and Y-Chromosome Data Reveal Evidence for Historical Introgression of *Canis**

lycaon and *C. rufus* DNA into *C. latrans*, **DYAN J. STRAUGHAN*** and **STEVEN R. FAIN** (USFWS National Fish and Wildlife Forensic Laboratory, Ashland,

Defended by Poets: The Role of Art in Communicating Climate Change in Our National Parks

Science 171

Wednesday

1:30 p.m. – 5:00 p.m.

Program organizers: *Leigh Welling* National Park Service Climate Change Response Program, Fort Collins, CO) and *Will Elder* (Golden Gate National Recreation Area, San Francisco, CA)

Sponsored by the Pacific Division Sections on Ecology, Organismal Biology, and Environmental Sciences, and General and Interdisciplinary Studies

The National Parks have been described as America's best idea. The pristine waterways, majestic mountains, and cultural treasures protected under the National Park Service (NPS) Organic Act are a legacy to leave our children and grandchildren. The beauty and splendor of the nation's natural and cultural landscapes have inspired music, poetry, paintings, and dance from artists such as U2, Ansel Adams, Emma Lazarus, and Amelia Rudolph. Art played a critical role in the establishment of the NPS. In 1872, the paintings of Thomas Moran were presented to Congress as testimony to the extraordinary wildlife and terrain of what would become Yellowstone National Park and inspired them to set aside a system of national parks in 1916. Artistic expression remains an integral component for connecting the American public with their National Parks and in communicating the scientific complexity and rich cultural value of these special places. It is one of the three critical elements that Aristotle believed is necessary for effective human communication: *logos* (logic and reason), *pathos* (appeal to the audience's emotions), and *ethos* (being of moral character). As scientists we understand that the parks, while protected, are not unimpaired. Global climate change in particular is challenging the ability of the NPS to carry out its mission of preserving nature unimpaired for the enjoyment of future generations. While some impacts of climate change have already been documented, we are only beginning to grasp the possible long-range consequences. These will likely include the loss of native species, arrival of new species and diseases, loss of coastal resources to rising water levels, an increase in ocean temperatures and acidification, and changes in snowpack, streamflow, and fire severity and frequency. What will this mean for how America perceives and experiences its parks? How can we appeal to the logic, emotion, and moral integrity of the American public to communicate science and inspire action in abating the consequences of climate change?

The speakers in this symposium will demonstrate examples

of how visual, audio, and emotive expression is being used in National Parks of the Pacific region to capture and communicate the science of climate, its impacts, and the risks to park values. Images, stories, and poems will be shared by park employees and friends from Golden Gate National Recreation Area, Crater Lake National Park, Yosemite National Park, and the NPS Climate Change Response Program Office. Examples will include the Artwork of Artist-In-Residence participants, a program that offers opportunities for artists, photographers, sculptors, performers, writers, composers, and craft artists to live and work in the 29 parks currently participating in this program. Other examples will be communication and outreach products developed through Research Learning Centers (RLCs) in the NPS such as the Crown of the Continent Research Learning Center and the Crater Lake Science and Learning Center. Discussions will explore how art and science can be used together to more effectively communicate the profound effects that climate change is having on our nation's heritage. By bringing together Aristotle's *logos* (logic of climate science), *pathos* (emotional connection to nature), and *ethos* (the integrity of interpretive rangers), the NPS is in a unique position to foster changes in science literacy and social awareness through art and creative media tools.

Moderator: *Leigh Welling*

1:30 *Introductory Comments*

1:35 *77 Harnessing the Communication Power of the National Parks to Address Climate Change*, **LEIGH WELLING** and **ANGIE RICHMAN** (Climate Change Response Program, National Park Service, Fort Collins, CO).

2:05 *78 From Cool Globes to Kid's Songs – Can Art in the Parks Make Climate Change Connections?* **WILL ELDER^{1*}**, **LAURA CASTELINI¹**, **CRISSEY FIELD CENTER STAFF²** and **GEORGE SU¹** (¹Golden Gate National Recreation Area, Fort Mason, San Francisco, CA; ²Golden Gate National Parks Conservancy, Crissy Field Center, San Francisco, CA).

2:35 *79 Crater Lake National Park: Translating the Wonder Through Art and Sound!* **LINDA HILLI GOSS** (Crater Lake Science and Learning Center, Southern Oregon University, Ashland, OR 97520).

3:05 **BREAK**

3:20 *80 Visualizing Climate Change: A Survey*, **WILL GEORGE^{1*}** and **MICHEAL LIANG²** (¹Lewis and Clark National Historic Park, Astoria, OR; ²North Cascades National Park and North Coast and Cascades Science Learning Network, Sedro-Woolley, WA).

SYMPOSIA – Wednesday

3:50 81 *Painting the Lifespan of a Forest*, **JIM A. LUTZ** (College of the Environment, University of Washington, Seattle, WA).

4:20 *Open Discussion on the Intersection of Art and Science in Climate Change Communication*

II. WORKSHOPS

Monday, 14 June 2010

Promoting Meaningful Learning

Science 165

Monday

1:30 p.m. – 5:00 p.m.

Half-day workshop organized by Dr. Kathleen Fisher (Professor Emerita, Department of Biology and Center for Research in Mathematics and Science Education, San Diego State University, and Co-founder and Chief Educational Officer, Semantic Research, Inc., San Diego, CA) and sponsored by Semantic Research Inc. (San Diego, CA).

Semantica[®] is a commercial product developed by Semantic Research Inc. (SRI) in San Diego. It is descended from SemNet[®], a semantic networking tool developed by the author's research group at the University of California, Davis in the early eighties. Earlier versions of Semantica / SemNet have been used widely, primarily in higher education, in business settings in the US and Europe, and in K-12 classes. The author and a graduate student introduced Semantica into High Tech Middle School in San Diego last year.

Research suggests that when students organize the knowledge they are acquiring in the form of a semantic network, their learning and retention are enhanced significantly. Further, students may also acquire desirable and lasting learning habits.

When a faculty member reviews a semantic network, s/he can often diagnose a student's particular learning problems and give very explicit feedback to improve that student's learning. This benefit is particularly pronounced with ESL students, who often haven't yet mastered the verbs critical for understanding the topic. For example, a student who doesn't know the difference between 'has a part' and 'is a part of' has difficulty mastering biology. In general, verbs are more challenging to learn than nouns and are learned later than nouns.

Workshop participants will be given access to a website where they can download SemanticaEdu at no charge. SemanticaEdu 3.0 contains, on the Help menu, the Manual, a tutorial, and a Sample Gallery containing semantic networks in various sciences and other subjects.

Limited to 24 participants.

Tuesday, 15 June 2010

Science Education for New Civic Engagements and Responsibilities (SENCER) Workshop

Science 225

Tuesday

8:00 a.m. – 12:00 p.m.

Half-day workshop organized by Drs. Amy Shachter (Associate Provost, Office of Research Initiatives, Santa Clara University, Santa Clara, CA) and Stephen Carroll (Department of English, Santa Clara University, Santa Clara, CA).

Initiated in 2001, Science Education for New Civic Engagements and Responsibilities (SENCER)¹ is a national dissemination project funded by the National Science Foundation. SENCER has established and supported an ever-growing community of faculty, students, academic leaders, and others to improve undergraduate STEM (science, technology, engineering and mathematics) education for non-science majors by connecting learning to critical civic questions. In 2007, the SENCER project established five regional SENCER Centers of Innovation (SCI). The SCIs expand the work of SENCER by organizing regional workshops designed to foster a multi- and interdisciplinary approach to science education with a focus on civic engagement. SCI-West is organizing this workshop to provide opportunities for AAAS members to engage SENCER faculty, discuss SENCER approaches, and consider developing regional collaborations. The AAAS Pacific Division SENCER workshop will have several one-hour segments:

- SENCER Overview and Model Courses (Amy Shachter, Santa Clara University). A dynamic introduction to the SENCER project including an overview of an interdisciplinary set of SENCER Model courses.
- Designing a SENCER course (Amy Shachter, Santa Clara University). An interactive workshop that takes participants through a nine step program to design a SENCER science course.
- Assessment using the SENCER Self-Assessment of Learning Gains Instrument (Stephen Carroll, Santa Clara University). An introduction to the SALG instrument and how it can be used to understand perceptions of student learning gains.

Limited to 24 participants.

¹<http://www.sencernet/About/projectoverview.cfm>

***Evidence-Based Research, the Science
of Research Synthesis: Implications and
Applications in the Delivery of Health Care***

Science 164
Tuesday
8:30 a.m. – 4:30 p.m.

Full-day workshop, organized by Dr. Francesco Chiappelli (Professor, UCLA School of Dentistry, Division of Oral Biology and Medicine, University of California, Los Angeles, CA).

Evidence-based medicine/nursing/dentistry is a complex process of health care delivery that rests on three distinct scientific domains. First, evidence-based research seeks to evaluate pre-clinical and clinical research in order to obtain the “best available” evidence by means of systematic reviews and meta-analyses. Second, in the context of developing evidence-based clinical practice, the best available evidence is integrated in carefully crafted revisions of clinical practice guidelines. Third, the actual delivery of evidence-based health care rests on the integration of decision-making theories (e.g., utility theory) articulated so as to favor the integration of revised clinical practice guidelines into clinical intervention. Together, these three elements proffer evidence-based modes of treatment for optimizing clinical outcomes for the benefit of the patient. Thus, evidence-based health care rests fundamentally on the initial evaluative evidence-based research synthesis step for identifying the “best available” evidence. The goal of this workshop is to provide the audience with the basic skills and tools to perform evidence-based research.

If possible, participants should bring their laptop computer in order to connect to Pubmed or other websites as needed during the workshop. Wireless internet access will be available.

Limited to 24 participants.

***A Discussion on the Value
of Advanced Placement Programs
from High School and University Perspectives***

Science 215
Tuesday
1:30 p.m. – 5:00 p.m.

One-half day workshop organized by Drs. William B.N. Berry (University of California, Berkeley, CA) and William Wiecking (Hawai'i Preparatory Academy, Waimea, HI).

This discussion/workshop will begin to address the topic of the value of Advanced Placement courses at the high school level. Perspectives will come from high school students and instructors, university professors, and others interested in this very important issue. Three foci of the workshop will be:

- Benefits and drawbacks of high school AP programs from the student, parent, instructor and professor's perspectives.
- How can we best prepare our students for the future? Is AP part of the solution, part of the problem, or part of both?
- Field studies: a prototype for a new level of AP curriculum?

Wednesday, 16 June 2010

***Science and Religion: A Philosophical Look
at Issues and Approaches***

Science 215
Wednesday
8:30 a.m. – 12:00 p.m.

One half-day session, organized by Prakash Chenjeri (Department of Language, Literature and Philosophy, Southern Oregon University, Ashland, OR).

This workshop will explore some of the critical issues that science and religion have contested, focusing primarily on the methodological and epistemological questions.

The session will include a panel discussion and a documentary exploring the interaction between science and religion by looking at some of the landmark issues that have punctuated their relationship over the last five hundred years. Among the topics explored are: the nature of the scientific method; the trial of Galileo and its implications; the implications of Newton’s mechanistic world view; the Darwinian revolution and the post-Darwinian controversies, in particular the debate over the ‘intelligent design’ argument; faith and reason; and cosmology and questions of origin. The sessions will also examine the question, “Does science make belief in religion obsolete?”

Geometry as a Design Tool

Science 067
Wednesday
8:30 a.m. – 5:00 p.m.

Full-day workshop organized by Dr. Rochelle Newman (Professor Emerita, Northern Essex Community College, Haverhill, MA).

This all-day, hands-on workshop takes an interdisciplinary approach to exploring relationships that exist in the world of nature, the domain of forms and the arena of ideas. Space, common to Art, Mathematics and Nature, is the central focus. Examining the natural world, participants use geometry as the design tool for creating art works. Emphasis is placed on taking a concept through craft to a completed composition. The thread that weaves this activity together are the concepts of the Golden Ratio and the Divine Proportion.

No art or math experience is necessary, just a desire to play with ideas and materials. All supplies and hand-outs will be provided for a \$5.00 workshop fee.

Limited to 24 participants.

III. CONTRIBUTED ORAL PRESENTATIONS

1100 (time italicized and underlined) indicates a student presentation

* indicates the speaker from among several authors listed

63 (bolded number) indicates abstract number

Monday, 14 June 2010

*Joint Session of Sections of
Anthropology and Archaeology
Health Sciences*

Science 215

Monday

8:45 a.m. – 11:30 a.m.

Program organizers: *Stephen R. Frost* (Department of Archaeology, University of Oregon, Eugene, OR), *Walter Carl Hartwig* (Division of Basic Medical Sciences, Touro University College of Osteopathic Medicine, Mare Island, CA), and *H.K. Choi* (Department of Biology, California State University Dominguez Hills, Carson, CA).

Anthropology and Archaeology

Session Chair: *Stephen R. Frost*

8:45 *Introductory Comments*

8:50 82 *Orientalism, Invention, and the New Exotic: A Study of American Belly Dance*, **JENNIFER HAYNES-CLARK** (Independent Scholar, Talent, OR).

9:10 83 *Composition of Ancient Rope and Cloth from the Judean Desert*, **TERENCE M. MURPHY**^{1*} and **NAHUM BEN-YEHUDA**² (¹Department of Plant Biology, University of California, Davis, CA; ²Department of Jewish History, Bar Ilan University, Ramat-Gan, Israel).

9:30 84 *Sexual Dimorphism in Growth of Human Manual Digital Proportions*, **DEANNA M. MORRIS***, **STEPHEN R. FROST**, **ROBERT PASTOR**, **J. JOSH SNODGRASS**, **LAWRENCE SUGIYAMA**, and **FRANCES J. WHITE** (Department of Anthropology, University of Oregon, Eugene, OR).

9:50 85 *The Nguoi Rung Footprint: Evidence of Vietnam's "Forest People"?* **D. JEFFREY MELDRUM** (Department of Biological Sciences, Idaho State University, Pocatello, ID).

10:10 BREAK

Health Sciences

Session Chair: H.K. Choi

10:30 86 *Patent Foramen Ovale as a Cause of Migraine Headache in Adults with Congenital Heart Disease with No Known Cardiac Shunts*, **MARAT A. VOLMAN***, **RUBINE GEVORGYAN**, and **JONATHAN M. TOBIS** (Department of Medicine, Division of Cardiology, David Geffen School of Medicine at UCLA, Los Angeles, CA).

10:50 87 *H1N1: Then and Now*, **JESSICA BOWMAN** (Department of Biology, Southern Oregon University, Ashland, OR).

11:10 88 *Surfing for Misinformation: Emerging Trends in Vaccine Opposition Website Content*, **SANDRA J. BEAN** (Department of Public Health, College of Health and Human Sciences, Oregon State University, Corvallis, OR).

*Joint Session of Sections of
Psychology
Computer and Information Sciences
Social, Economic and Political Sciences
General and Interdisciplinary Studies*

Science 215

Monday

1:25 p.m. – 4:10 p.m.

Program organizers: *J. Kenneth Nishita* (Department of Psychology, California State University Monterey Bay, Seaside, CA), *Alan E. Leviton* (California Academy of Sciences, San Francisco, CA), *Carl A. Maida* (UCLA Schools of Dentistry and Medicine, University of California, Los Angeles, CA), and *Robert L. Chianese* (California State University (retired), Northridge, CA).

Session Chair: *Carl A. Maida*

1:25 *Introductory Comments*

1:30 89 *Software Security in the .Net Framework (Attack and Defense)*, **JON McCOY** (Department of Computer Science, Southern Oregon University, Ashland, OR).

CONTRIBUTED ORAL PAPERS – Monday

1:50 90 *The Imaginal Stone: Stories of Self and World*, **CYNDERA M. QUACKENBUSH** (Counseling Psychology, Pacifica Graduate Institute, Santa Barbara, CA).

2:10 91 *Science: A Lever for Global Integrity*, **KALÁ PERKINS** (Department of Bioethics, Loyola Marymount University, Los Angeles, CA).

2:30 92 *Environmental Transformation, Migration and Conflict: Resource and Identity Issues in Contemporary Diasporas*, **ANITA HAGY FERGUSON** (Southern Oregon University, Ashland, OR).

2:50 BREAK

3:10 93 *Cartooning Misery: Images of the Great Depression and New Deal*, **MARK ALDRICH** (Department of Economics, Smith College, Northampton MA).

3:30 94 *The Counter-Intuitive Disharmony of Intuition Research in the Cognitive Sciences*, **JOHN CLEVENGER*** and **CHARLES WALLIS** (Department of Philosophy, California State University, Long Beach, CA).

3:50 95 *Individual Heterogeneity of Perceptual/Cognitive/Cogitative/Action Types among Scientists*, **MAGOROH MARUYAMA** (Interactive Heterogenistics, San Diego, CA).

Tuesday, 15 June 2010

***Joint Session of Sections of
Education
Chemistry and Biochemistry***

Science 067

Tuesday

8:45 a.m. – 12:00 p.m.

Program organizers: *William B.N. Berry* (University of California Berkeley, Berkeley, CA) and *Owen M. McDougal* (Boise State University, Boise, ID)

Education

Session chair: *William B.N. Berry*

8:45 *Introductory Comments*

8:50 96 *The UCSD COSMOS Optical Engineering Cluster: A Month-Long Residential Intensive Academic Experience for Talented Grades 9 - 12 Students*, **ERNEST M. KIM^{1*}**, **CLARK C. GUEST²**, **REBECCA L. HAMES²**, **CHARLES W. TU²**, and **PETER N. ILINYKH²** (¹Department of Engineering, University of San Diego, San Diego, CA; ²Jacobs School of Engineering, University of California, San Diego, La Jolla, CA).

9:10 97 *A Creek Flows Through: Project Based Learning in an Environmental Science Course*, **WILLIAM B. N. BERRY*** and **MATHIAS KONDOLF** (Environmental Science Program, College of Undergraduate Interdisciplinary Studies, University of California, Berkeley, CA).

9:30 98 *An Evaluation of the Effect on Student Learning of Using Multiple Textbook Editions in Course Delivery*, **THOMAS F. SCHUBERT, JR.***, **FRANK G. JACOBITZ**, and **ERNEST M. KIM** (Department of Engineering, University of San Diego, San Diego, CA).

9:50 BREAK

Chemistry and Biochemistry

Session Chair: *Owen M. McDougal*

10:20 99 *Use of X-ray Microanalysis and Infrared Microspectroscopy for Multianalytical Characterization of the Walters Codex, an Ethiopian Manuscript*, **NATASJA A. SWARTZ*** and **TAMI LASSETER CLARE** (Department of Chemistry, Portland State University, Portland, OR).

10:40 100 *Going Green in the Organic Lab*, **AUBREY JOHNSTON^{1*}**, **MICHAEL M. McCORMICK²**, **KAREN HAMMON¹**, **DON WARNER¹**, and **OWEN M. McDOUGAL¹** (¹Department of Chemistry and Biochemistry, Boise State University, Boise, ID; ²Homeland Security, Chicago, IL).

11:00 101 *Abiotic Organic Synthesis at Seafloor Hydrothermal Systems on Prebiotic Earth*, **JOHN R. HOLLOWAY** (Department of Chemistry and Biochemistry and School of Earth and Space Exploration, Arizona State University, Tempe, AZ).

11:20 102 *A Transport Model for the Adsorption of Oxyanions of Arsenic onto Lanthanum and Actinium Oxides and Hydroxides and Calcite*, **ANPALAKI J. RAGAVAN** (Department of Environmental Engineering, University of Nevada, Reno, NV).

11:40 103 *Bifurcation Analysis of Cooperative Binding Enzymes-substrate Systems*, **DAVID BLACKMAN** (University of California Berkeley (retired), Phoenix, OR).

***Joint Session of Sections of
Ecology, Organismal Biology and
Environmental Sciences
Cell and Molecular Biology***

Science 057

Tuesday

9:05 a.m. – 11:50 a.m.

Program organizers: *Richard Van Buskirk* (Department of Environmental Studies, Pacific University, Forest Grove, OR), *Michael Parker* (Department of Biology, Southern Oregon University, Ashland, OR) and *Kenneth Cornell* (Department of Chemistry and Biochemistry, Boise State University, Boise, ID)

Session Chair: *Kenneth Cornell*

Ecology, Organismal Biology and
Environmental Studies

8:55 *Introductory Comments*

9:00 104 *The Origin of the Domestic Dog Revisited*, **JANICE KOLER-MATZNICK** (Central Point, OR).

9:20 105 *Ecology of Alpine and Subalpine Populations of Botrychium pumicola (Pumice Moonwort), a Rare Cascade Range Endemic Fern*, **SUSAN ROE-ANDERSEN***, **DARLENE SOUTHWORTH**, and

STEWART W. JANES (Department of Biology, Southern Oregon University, Ashland, OR).

Molecular Biology, ²Department of Biology, Brigham Young University, Provo, UT).

Cell and Molecular Biology

9:40 106 *The Roles of Different CLE Domains in Arabidopsis CLE Polypeptide Functional Specificity and Activity*, LING MENG^{1*}, KENNETH C. RUTH¹, JENNIFER C. FLETCHER², and LEWIS FELDMAN¹ (¹Department of Plant and Microbial Biology, University of California, Berkeley, CA; ²Plant Gene Expression Center, USDA-UC Berkeley, Albany, CA).

10:00 BREAK

10:20 107 *Saccharomyces cerevisiae Adhesion Properties Influenced by Saccharides*, LAURINE J. SHAHMIRIAN^{1*} and STEVEN B. OPPENHEIMER² (¹Chaminade College Preparatory High School, West Hills, CA; ²Department of Biology and Center for Cancer and Developmental Biology, Northridge, CA).

10:40 108 *Interaction Between Ah Receptor and Stat1 Proteins During Cell Cycle Progression*, CHERI L. LAMB* and KRISTEN A. MITCHELL (Dept. of Biological Sciences, Boise State University, Boise, ID).

11:00 109 *Effect of Solar UV Radiation and Nuclear Receptor Signaling in Keratinocyte and Melanocyte Homeostasis*, DANIEL COLEMAN^{1,2*}, ZHIXING WANG¹, HYOSANG JANG¹, STEPHEN HYTER^{1,2}, XIAOBO LIANG¹, LIONEL LARUE⁴, GITALI INDRA¹, and ARUP INDRA^{1,2,3} (¹Department of Pharmaceutical Sciences, College of Pharmacy, ²Molecular and Cellular Biology Program, ³Environmental Health Science Center, Oregon State University, Corvallis, OR; ⁴Developmental Genetics of Melanocytes, Institut Curie, Orsay Cedex, France).

11:20 110 *Creation of MTN Gene Knock-outs To Probe Autoinducer Effects on Bacterial Virulence*, KELLI PEASE^{1*} and KEN CORNELL² (¹Department of Biological Sciences, and ²Department of Chemistry & Biochemistry, Boise State University, Boise, Idaho 83725-1520; kellipeace@u.boisestate.edu).

11:40 111 *Localization of Thymidine Kinase 1 in Human Lymphoma Cells through Immunogold Labeling Transmission Electron Microscopy*, MELISSA TOVAR¹, MORGAN HARDY^{1*}, MICHAEL STANDING², KIM O'NEILL¹, and RICHARD ROBISON¹ (¹Department of Microbiology and

IV. CONTRIBUTED POSTER PRESENTATIONS

189 poster number is also the abstract number

193 (number italicized and underlined) identifies a student presentation

*identifies the presenter from among several authors listed

NOTE TO PRESENTERS: Boards on which to attach poster presentations will be set up in the hallway of the first floor of Science Hall. The poster boards have numbers on them that coincide with the numbers assigned to the posters in this program (see number to the left of the title of each presentation). You are expected to use the appropriately numbered board for your poster.

Posters should be set up at least 10 minutes prior to the start time of your session. You must be present with your poster for at least one hour during the four hours of the poster session in order to discuss your work. Cards will be available to use in posting the time(s) you will be available. **If you are a student in competition for an Award of Excellence, you must be present with your poster from 12:00 p.m. to 2:00 p.m. in order to give judges the opportunity to review and discuss your work with you.** Posters should be removed within one-half hour of the end of the session. Presenters assume full responsibility for the security of their poster and other materials. Unclaimed posters will be discarded at the close of the technical sessions Wednesday afternoon.

*Quick Directory of Sponsoring Sections
and Their Posters*

<i>Section</i>	<i>poster numbers</i>
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Cell and Molecular Biology	140 – 146
Chemistry and Biochemistry	138 – 139
Earth Sciences	121
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Education	122 – 123
Health Sciences	124 – 133
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Physics and Materials Science	134 – 135
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Social, Economic and Political Sciences	150 – 151

Monday, 14 June 2010

POSTER SESSION I

Science Hall, 1st Floor Hallway

Monday

12:00 PM – 4:00 PM

**ECOLOGY, ORGANISMAL BIOLOGY,
and ENVIRONMENTAL SCIENCES**

- 112 *Analysis of the Spatial and Temporal Distributions of Dolphinfishes (*Coryphaena hippurus* and *C. equiselis*) in the Eastern Pacific Ocean*, **MARSHALL OLSON** (Department of Marine Science and Environmental Sciences, University of San Diego, San Diego, CA).
- 113 *An Analysis of *Drosophila suzukii* Populations in Jackson County, Oregon in 2009*, **WILLIAM REDD OURSLER** (St. Mary’s High School, Medford, OR).
- 114 *Forensic Analysis Reveals Hidden Etchings on Whale*

Tooth Ivory, **MARGARET E. “COOKIE” SIMS and DARBY A. MORRELL** (National Fish and Wildlife Forensics Laboratory, Ashland, OR 97520).

- 115 *Water Mold Diseases of Amphibian Embryos: Interactions among Three *Saprolegnia* Species*, **SUSAN F. BRADY***, **R. STEVEN WAGNER**, **DANIEL J. SELSKI**, and **JAMES E. JOHNSON** (Department of Biological Sciences, Central Washington University, Ellensburg, WA).
- 116 *The Effects of a Newly Discovered Parasite (*Apocephalus borealis*) on the Health of Honey Bee Colonies*, **ANDREW CORE***, **JOHN HAFERNIK**, **JONATHAN IVERS**, **CHRIS QUOCK**, **CHRIS SMITH**, and **TRAVIS SIAPNO** (Department of Biology, San Francisco State University, San Francisco, CA).
- 117 *Aquatic Gilled Mushrooms in the Rogue River in Oregon: a New Species of *Psathyrella**, **JONATHAN L. FRANK^{1*}**, **ROBERT A. COFFAN²**, and **DARLENE SOUTHWORTH¹** (¹Department of Biology and ²Department of Environmental Studies, Southern Oregon University, Ashland, OR).
- 118 *Age-Specific Association with Potential Adult Habitat in Larval *Bocaccio*, *Sebastes paucispinis*, in the Southern California Bight*, **SEAN M. HITCHMAN^{1*}**, **NATHALIE REYNS¹**, and **RUSS D. VETTER²** (¹Department of Marine Science, University of San Diego, San Diego, CA; ²Fisheries Resources Division, Southwest Fisheries Science Center, La Jolla, CA).
- 119 *Declining – But Persistent – Atmospheric Contamination in Central California from the Re-suspension of Historic Leaded Gasoline Emissions as Recorded in the Lace Lichen (*Ramalina menziesii* Taylor) from*

1892-2006, **A. RUSSELL FLEGAL¹, CÉLINE GALLON¹, SHARON HIBDON¹, ZIKA KUSPA¹ and LÉO F. LAPORTE^{2*}** (¹Institute of Marine Sciences, University of California, Santa Cruz, CA; ²Department of Earth and Planetary Sciences, University of California, Santa Cruz, CA).

- 120** *Stanford University's Water Efficiency Program - 10 Years Later*, **MARGARET L. LAPORTE** (Stanford University, Utilities Division, Sustainability and Energy Management, Stanford, CA).

EARTH SCIENCES

- 121** *A New Kungurian Dyscritellid from the Kaibab Limestone of Southern Nevada*, **MICHAEL S. TOMA* and ERNEST H. GILMOUR** (Department of Geology, Eastern Washington University, Cheney, WA).

EDUCATION

- 122** *Using Inquiry to Foster Student Critical Thinking and Content Knowledge in Undergraduate Fundamental Biology*, **MIAO GAO^{1*}, IAN QUITADAMO¹, and RALF GREENWALD²** (¹Department of Biological Science, ²Department of Psychology, Central Washington University, Ellensburg, WA).

- 123** *A Flow Visualization Project in Fluid Mechanics*, **FRANK JACOBITZ*, BRYCE ABRAHAM, JEFF BENTZ, LAUREN DORUTH, MATT FOSTER, MATT GABBARD, MICHAEL JAROSINSKI, ADAM JONES, YEHIA OMAR, BRYAN REED, AVERI THOMAS, VICKY VARGAS, and CASEY WEISS** (Mechanical Engineering Program, University of San Diego, San Diego, CA).

HEALTH SCIENCES

- 124** *Gender and Racial/Ethnic Disparities in the Association between Body Mass Index and Walking Impairment in Persons with Knee Pain and Stiffness: A Population-Based Study*, **STEPHEN J. MOREWITZ** (Department of Nursing and Health Sciences, California State University, East Bay, Hayward, CA).

- 125** *A Comparison of Oral Health Status and Oral Health Quality of Life Based on Clinical Determinants in a National Probability Sample*, **MARK S. ORTEGA*, RAUL LEAL-RODRIGUEZ*, YI LUO, HONGHU LIU, and MARVIN MARCUS** (California Endowment Pipeline Program, UCLA School of Dentistry, Division of Public Health and Community Dentistry, Los Angeles, CA).

- 126** *Psychobiology of Immigration Stress: Relevance to Nasopharyngeal Carcinoma (NpC) Prevalence*, **RAISA AVEZOVA^{1*}, OLUWADAYO OLUWADARA¹, GEORGE KOSSAN¹, WILLIAM YOON¹, JAVIER IRIBARREN², and FRANCESCO CHIAPPELLI¹** (¹Division of Oral Biology and Medicine, University of California, Los Angeles (UCLA) School of Dentistry, Los Angeles, CA; ²UCLA Chicano Studies Research Center, Los Angeles, CA).

- 127** *Association Between Body Mass Index and Demographic Characteristics in a National Sample of Children, Ages 6-11*, **ANAMEVYS ECHEVARRIA*, LUCELIA RIVERA*, HONGHU LIU, YI LUO, and MARVIN MARCUS** (California Endowment Pipeline Program, Division of Public Health and Community Dentistry, UCLA School of Dentistry, Los Angeles, CA).

- 128** *Demographic and Behavioral Factors and Active Caries in a National Sample*, **DENISE I. ROBLES*, MONIQUE R. BELIN*, YI LUO, HONGHU LIU, and MARVIN MARCUS** (California Endowment Pipeline Program, Division of Public Health and Community Dentistry, UCLA School of Dentistry, Los Angeles, CA).

- 129** *Characterizing the Role of Monocytes in Immune Responses Against Oral Tumors*, **CHELCEE BAKER^{1*}, AIDA ARASTEH², HELEN TSENG², and ANAHID JEWETT²** (¹Howard Hughes Medical Institute Pre-College Science Education Program, UCLA School of Dentistry; ²The Weintraub Center for Reconstructive Biotechnology, UCLA School of Dentistry, Los Angeles, CA).

- 130** *Regulatory T Cells in Recurrent Aphthous Stomatitis*, **YESSICA JUAREZ^{1*}, AUDREY NAVARRO², and FRANCESCO CHIAPPELLI²** (¹Howard Hughes Medical Institute Pre-College Science Education Program, Los Angeles, CA; ²UCLA School of Dentistry, Los Angeles, CA).

- 131** *Tumor-Suppressive microRNAs Inhibit Cancer Cell Growth*, **DARRON KINNEY^{1*} and KI-HYUK SHIN²** (¹Howard Hughes Medical Institute Pre-College Science Education Program; ²No-Hee Park Laboratory, UCLA School of Dentistry, Los Angeles, CA).

- 132** *Micro-electrode Array Impedance as a Measure of Local Environment and Effects of Microstimulation*, **REBECCA A. PARKER^{1*}, RICK**

VANWAGENEN² and BRADLEY E. GREGER³

(¹Interdepartmental Program in Neuroscience, University of Utah, Salt Lake City, UT; ²Blackrock Microsystems, Salt Lake City, UT; ³Department of Bioengineering, University of Utah, Salt Lake City, UT).

- 133** *The Use of Network Visualization Methods to Represent the Association of Inbreeding with Lung Fibrosis Incidence in Beagle Dogs that Inhaled ²³⁸PuO₂ Or ²³⁹PuO₂*, **DULANEY WILSON^{1*}, ANDREA BRIGANTIC¹, ALAN CHAPPELL² and WILLIAM F. MORGAN¹** (¹Biological Sciences Division, Pacific Northwest National Laboratory, Richland, WA; ²National Security Directorate, Pacific Northwest National Laboratory, Seattle, WA).

Tuesday, 15 June 2010

POSTER SESSION IIScience Hall, 1st Floor Hallway

Tuesday

12:00 PM – 4:00 PM

**PHYSICS and
MATERIALS SCIENCE**

134 *Endotoxin Detection using Electrochemical Method and the Effect of Nanoscale Confinement*, GAURAV CHATTERJEE^{1*}, SRIVATSA AITHAL¹, LILIAN GONG², SUTAPA BARUA³, KAUSHAL REGE³ and SHALINI PRASAD^{1,4} (¹Department of Electrical, Computer and Energy Engineering, Arizona State University, Tempe, AZ; ²Wellesley College, Wellesley, MA; ³Mechanical, Chemical, Aerospace and Materials Engineering, Arizona State University, Tempe, AZ; ⁴Department of Electrical and Computer engineering, Portland State University, Portland, OR).

135 *Biogenic Silica Incorporated Bio Sensors for Ultra Sensitive Protein Detection*, GAURAV CHATTERJEE^{1*}, VINDHYA KUNDURU¹, SRIVATSA AITHAL¹, KAI-CHUN LIN², B. L. RAMAKRISHNA² and SHALINI PRASAD^{1,3} (¹Department of Electrical, Computer and Energy Engineering, Arizona State University, Tempe, AZ; ²Mechanical, Aerospace, Chemical and Materials Engineering, Arizona State University, Tempe, AZ; ³Department of Electrical and Computer Engineering, Portland State University, Portland, OR).

**INDUSTRIAL SCIENCE and
TECHNOLOGY**

136 *Co-precipitation of Oxyanions of Arsenic(III) onto Lanthanum and Actinium Oxides*, ANPALAKI J. RAGAVAN (Department of Environmental Engineering, University of Nevada, Reno, NV).

137 *Room Temperature Nucleic Acid Storage Technology and Sustainable Practice by Scientific Laboratories*, AUTUMN NAILES^{1*}, SUPANIGAR RUANGSRI², and ICHIRO NISHIMURA² (¹Howard Hughes Medical Institute Pre-College Science Education Program, UCLA School of Dentistry; ²The Weintraub Center for Reconstructive Biotechnology, UCLA School of Dentistry, Los Angeles, CA).

CHEMISTRY and BIOCHEMISTRY

138 *Equilibrium Conformational Dynamics in an RNA Tetraloop from Massively Parallel Molecular Dynamics*, ALLISON J. DEPAUL¹, ERIK J. THOMPSON², SARAV S. PATEL^{1*}, KRISTIN HALDEMAN³, and ERIC J. SORIN¹ (¹Department of Chemistry and Biochemistry, ²Department of Chemical Engineering, and ³Department of Mathematics and Statistics, California State University Long Beach, Long Beach, CA).

139 *Using NMR Techniques in a Model Biphasic System to Find Partition Coefficients*, EMILY DRUSSEL^{1*}, BRYAN MARTIN¹, DAVID LUKER¹, MICHAEL HILL², GERRY CHINGAS¹, and OWEN McDOUGAL¹ (¹Department of Chemistry and Biochemistry, Boise State University, Boise, ID; ²Boise Technology Inc., Nampa, ID).

CELL and MOLECULAR BIOLOGY

140 *Expression and Purification of West Nile Virus prM Candidate Antigen for an Oral Vaccine*, REECE KNIPPEL* and KENNETH CORNELL (Department of Chemistry and Biochemistry, Boise State University, Boise, ID).

141 *Cx3cl1 Gene Expression in Adipogenic and Osteogenic Induced Bone Marrow Stromal Cells*, KEMI OYEWOLE^{1*}, BELLIN ENRIQUES^{1*}, NINI CHAICHANASAKUL², OLGA BEZOUGLAIA², JEANNE NERVINA², and SOTIRIOS TETRADIS² (¹Howard Hughes Medical Institute Pre-College Science Education Program, UCLA School of Dentistry, Los Angeles, CA; ²UCLA School of Dentistry, Los Angeles, CA).

142 *Cyclic Adenosine Monophosphate and Glucose Regulate Transcription of microRNA-375 via a Protein Kinase A Dependent Pathway*, ELIZABETH CLARK*, JAMIE MILLS, JUAN ARAUJO-SARINANA*, and DAVID M. KELLER (Department of Biological Sciences, California State University Chico, Chico, CA).

143 *Creating EF1- α Promoter pTRIPz Vectors to Express Cdk2ap1-shRNAmir in Mouse Embryonic Stem Cells*, RIGO MARTINEZ^{1*}, JAMAL MATTHEWS^{1*}, AMIT DESHPANDE², JEFFREY KIM², and DAVID T. WONG² (¹Howard Hughes Medical Institute Pre-College Science Education Program, UCLA School of Dentistry, Los Angeles, CA; ²Dental Research Institute, UCLA School of Dentistry, Los Angeles, CA).

144 *A Novel Method for Interrogating Loss of Function in Apoptosis*, **CHARLES W. MORGAN^{1*}, DANIEL C. GRAY¹, and JAMES A. WELLS²** (¹Graduate Group in Chemistry and Chemical Biology, ²Departments of Pharmaceutical Chemistry and Cellular and Molecular Pharmacology, University of California San Francisco, San Francisco, CA).

145 *Delta-Catenin Positively Modulates Gamma-Secretase Function in Alzheimer's Disease*, **LILLIAN F. ZHANG*, MOCHTAR PRIBADI, XIN LIU, and HONG WU** (Department of Molecular and Medical Pharmacology, David Geffen School of Medicine, University of California Los Angeles, Los Angeles, CA).

146 *The Differences of Mineralization and Differentiation between Regular and Induced Dental Pulp Stem Cells*, **TAYLOR ROBERSON^{1*}, MO KANG², JUEUN OH², and SHEBLI MEHRAZARIN²** (¹Howard Hughes Medical Institute Pre-College Science Education Program, UCLA School of Dentistry; ²UCLA School of Dentistry, Los Angeles, CA).

PSYCHOLOGY

147 *The Effects of Masking on Just Noticeable Differences of Frequency*, **COLTON B. CHRISTIAN** (Department of Psychology, Southern Oregon University, Ashland, OR).

148 *Olfactory Priming and Self-Perceived Ratings of Empathy*, **COLTON B. CHRISTIAN and JEFFREY D. WHITAKER*** (Department of Psychology, Southern Oregon University, Ashland, OR).

149 *Evaluative Framing and Escalation of Commitment*, **SAMUEL WALLIS^{1*} and CHARLES WALLIS²** (¹Rogers Middle School, Long Beach, CA; ²Department of Philosophy, California State University, Long Beach, CA).

SOCIAL, ECONOMIC, and POLITICAL SCIENCES

150 *Gender of Missing Persons and the Number of Years That They are Reported Missing in Missing-Persons Reports*, **STEPHEN J. MOREWITZ** (California State University, East Bay, Department of Nursing and Health Sciences, San Francisco, CA).

151 *Age of Missing Persons and the Classification of Their Behavior as Unusual in Missing-Persons Reports*, **STEPHEN J. MOREWITZ** (California

State University, East Bay, Department of Nursing and Health Sciences, San Francisco, CA).

AGRICULTURE and HORTICULTURAL SCIENCES

152 *Farming and Seed Conservation Practices Of Rice Farmers in the Marginal Uplands of Lake Sebu, South Cotabato, Philippines*, **FLORENCE LASALITA-ZAPICO*, TRES TINNA MARTIN, RUBY JANE PENA, and CATHERINE HAZEL AGUILAR** (Science Department, College of Natural Sciences and Mathematics, Mindanao State University, Fatima, General Santos City).

153 *Genetic Diversity Analysis of Traditional Upland Rice Cultivars in Kihan, Malapatan, Sarangani Province, Philippines Using Morphometric Markers*, **FLOR-ENCE C. LASALITA-ZAPICO^{1*}, JAIME A. NAMOCATCAT¹, and JOSEPHINE L. CARIÑO-TURNER²** (¹Science Department, College of Natural Sciences and Mathematics, Mindanao State University, Fatima, General Santos City; ²Indigenous Peoples Development Program, Office of the Provincial Governor, Provincial Capitol, Alabel, Sarangani Province).

ABSTRACTS

Abstracts are grouped by program.

Not all presenters submitted an abstract.

Except for editing of titles, authors and affiliations for consistency, abstracts have not been edited to any degree for grammar or content and are presented as submitted by the authors.

PUBLIC LECTURES

Monday Noon Public Lecture 12:15 p.m. in Science 118

1 *Science Education for New Civic Engagements and Responsibilities (SENCER): An NSF-funded Science Education Reform Project*, **AMY M. SHACHTER** (Department of Chemistry and Biochemistry, Santa Clara University, 500 El Camino Real, Santa Clara, CA, 95125; ashachter@scu.edu).

Science Education for New Civic Engagements and Responsibilities (SENCER) is a national science education reform project funded by the National Science Foundation. SENCER is intended to help improve science learning for non-science majors by connecting learning to critical civic questions. In 2007, the SENCER project established five regional SENCER Centers of Innovation (SCI). The SCIs expand the work of SENCER by organizing regional workshops designed to foster a multi- and interdisciplinary approach to science education with a focus on civic engagement. The main focus of SCI-West is environmental sustainability with an emphasis on water resources and air quality. SCI-West also strives to foster undergraduate research through collaborative regional projects. An overview of SENCER and SCI-West will be presented.

Monday Evening Plenary Lecture 7:00 p.m. in Science 118

2 *Frontiers in Ecological Theory: The Role of Wolves as Keystone Predators*, **CHRISTINA EISENBERG** (PhD Candidate, Boone & Crockett Fellow, College of Forestry, Oregon State University, Corvallis, OR; Christina.Eisenberg@oregonstate.edu).

Once thought of as “varmints” that had to be eliminated to protect human interests, wolves are now considered keystone species that optimize ecosystem structure and function and increase biodiversity. What enabled the scientific world, resource managers, and the public to acknowledge the benefits of this species and enable its recovery in a variety of landscapes? I will present archival material from the work of Aldo Leopold and the early ecologists who created the revolutionary theoretical and practical foundations for today’s trophic cascades science, and will show examples of the keystone role wolves play from my research in the northern and southern Rocky Mountains.

Tuesday Noon Public Lecture 12:15 p.m. in Science 118

3 *The Art of Biology and the Biology of Art: High Tech High Presentation of Learning*, **JAY VAVRA** (High Tech High, 2861 Womble Rd., San Diego, CA, 92106; jvavra@hightechhigh.org).

The biology classroom can lend itself to creative expression in a variety of activities both in the lab and the field. In the project-based learning environment of the High Tech High (HTH) Biotechnology Program students experiment with a range of artistic media including pipetting pointillism, genetically modified paint, and wildlife photography. Art in the science classroom can enhance learning and provide alternative media for informing a scientifically naive public. By incorporating art, science students take their learning one step further than the scientific method. Following background research, hypothesis formulation, testing, and data analysis, students produce informative, beautiful visuals key to the dissemination of scientific concepts.

On the road to becoming scientifically literate, artistic expression can be a great vehicle to keep students moving forward as they build their science vocabulary. Besides enhancing cognition, artistic expression activities such as painting with a pipette can reinforce lab skills in a colorful way compared to more mundane procedures.

Art exercises in the science lab allow students to demonstrate art as an effective means of communicating to a broader audience. Using San Diego Bay as an outdoor laboratory, HTH students and teachers have published a series of art-filled books on the region. Inspired by author/photographer Robert Vavra and the work of Andy Goldsworthy, the books are filled with student-generated sketches, photographs and graphics. In capturing the beauty and destruction of nature in an urban setting, HTH students explore their own communities and in turn themselves through the marriage of science and art.

Tuesday Evening Presidential Lecture Following dinner, in the Rogue River Room of Stevenson Union

4 *No abstract was submitted.*

Wednesday Noon Public Lecture 12:15 p.m. in Science 118

5 *No abstract was submitted.*

SYMPOSIA

**Sixth Annual Symposium on
Materials Science and Nanotechnology
Monday, 8:30 a.m. in Sc 171**

6 *A Novel Thermoelectric High Vacuum Cryo-stage*, **JUSTIN HAYNES, MICHAEL WORKMAN, and PETER K. WU** (Department of Physics, Southern Oregon University, Ashland, OR 97520; jtor14@gmail.com).

A cryo-stage in a high vacuum, $< 10^{-4}$ Pa, environment is needed for many types of applications, for example, Matrix-Assisted Pulse-Laser Deposition. This is commonly achieved by flowing liquid nitrogen (LN) through the cold stage. Drawbacks of this system are the high continual operating cost of the LN and the inconvenience of refilling LN throughout the course of the deposition. In this work, we investigated the capability of commercially available thermoelectric devices (TEDs) in cooling a sample stage in vacuum. We demonstrated that a temperature below -100 °C can be achieved with two TEDs in series backed by a water-cooled copper block as a heat sink. Each TED is controlled by an independent DC power supply. Because a TED generates its own heat, the copper heat sink must remove the heat from the sample to maintain its temperature as well as that generated by the TEDs. Because the heat flow from the sample to the heat sink is a sequential process, the choice of TEDs is critical. Each TED must be able to remove sufficient heat from the sample as well as that generated by all prior TEDs. Otherwise, a TED in a previous stage can burn out due to heat accumulation. Our testing results and the design theory and procedure will be presented.

7 *The Effects of Thermo-mechanical Processes and PH on the Corrosion Behavior of AA6111 Aluminum Auto Panels*, **MATTHEW A. FLOYD* and GEORGE K. QUAINOO** (Department of Physics, Materials and Engineering, Southern Oregon University, Ashland, OR 97501; floydm@students.sou.edu).

The need to improve fuel efficiency in automobiles has caused manufacturers to look for ways to reduce the weight of vehicles. The C.A.F.E standard is a set of regulations that encourage better fuel economy. This is only one of the many reasons that auto manufacturers are striving to reduce emissions and increase fuel efficiency. Due to the value of lightening motor vehicles, auto manufacturers are already using AA6111 aluminum alloy for hoods and trunk lids. Several of the advantages to using this material are that it is very light weight compared to the steel used in automobiles, it has a high dent resistance, it is corrosion resistant, and its tensile strength and hardness are actually improved in the production process. Some of the production processes that AA6111 undergoes in order to be made into auto body panels include bending and stretching, and baking as part of the paint process. Previous studies have shown that as a result of the deformation, the mechanical properties of this alloy

are enhanced and the paint baking process improves the characteristics of the metal. However, because of its use as an automotive body panel, these materials will be exposed to corrosive materials such as soapy water and road treatments. Not much is known yet about how the manufacturing processes will affect the corrosion characteristics of this material. The goal of this study is to investigate the effects of thermo-mechanical processes and pH on the corrosion behavior of AA6111. Results of the electrochemical corrosion current studies currently under way will be correlated with thermo-mechanical properties and presented.

8 *Corrosion Behavior of Aluminum AA6611 under Varying Conditions of Cold Work, Artificial Aging, and pH*, **TYLER L. FOWLER* and GEORGE K. QUAINOO** (Department of Physics, Materials Science and Engineering, Southern Oregon University, Ashland, OR 97520; fowlerty@students.sou.edu).

In the wake of the 1973 Arab Oil Embargo, the US Congress passed the Corporate Average Fuel Economy (CAFE) regulations. CAFE intended to improve the average fuel economy of vehicles in the US. One of the most effective means of improving fuel economy is by reducing the weight of automobile designs. On many vehicles, steel body panels have been replaced by aluminum panels. One of the most promising alloys for this application is Aluminum Alloy 6611 for its unique strengthening characteristics meshing well with automotive manufacturing processes. The strength of AA6611 increases significantly during the automotive paint bake cycle via artificial aging. Work reported in the open literature show that cold working AA6611 prior to heat treatment yields even higher strength. The goal of this research is to determine what effects cold work, artificial aging, and pH have on the corrosion resistance of aluminum. A CH Instruments 832 Electrochemical Detector was used to run linear sweep voltammetry to measure the corrosion current of test samples. Sample corrosion current is a direct indicator of the corrosion rate of the material under different environmental conditions.

9 *Iridium Oxide Nanomonitors: Clinical Diagnostic Devices for Health Monitoring Systems*, **SHALINI PRASAD^{1,3*} VINU VENKATRAMAN¹, RAVIKIRAN REDDY¹, FENGYAN ZHANG², DAVID EVANS², and BRUCE ULRICH²** (¹Portland State University, Portland OR 97201; ²Sharp Labs of America Inc, Camas WA 98607; ³Arizona State University, Tempe AZ 85287; sprasad@pdx.edu).

The objective of this research is to demonstrate the potential of iridium oxide (IrOx) nanowires based device towards detection of proteins that are disease biomarkers. This device is based on electrical detection of protein biomarkers wherein an immunoassay is built onto the iridium oxide nanowires that in turn undergoes specific electrical parameter perturbations during each binding event associated with the immunoassay. Detection of two inflammatory proteins C - reactive protein (CRP) and Myeloperoxidase (MPO) that are biomarkers of cardiovascular diseases is demonstrated. The performance metrics of the

device in response to the two biomarkers in pure form and in serum samples were evaluated and compared to standard ELISA assays. The methodology that has been adopted is based on measuring impedance and calibrating its change in magnitude with concentration of proteins. We demonstrate the following performance metrics: limits of detection up to 1 ng/ml for CRP and 500 pg/ml for MPO in pure and serum samples; linear dynamic range of detection from 10 ng/ml – 100 µg/ml for CRP and 1 ng/ml - 1 µg/ml for MPO and cross-reactivity contained at less than 10% of selective binding for both the inflammatory proteins.

Iridium oxide has an ability to detect very small changes to the surface charge and this capability is utilized for achieving the performance metrics and forms the basis of the key innovations of this technology, which are, improving the selectivity and sensitivity of detection.

10 *Quantum Mechanics of Cation Transport*, **DAVID BLACKMAN** (Retired, UC Berkeley Physics, 307 W 2nd St., Phoenix, OR 97535-7733; Gribear@mac.com).

When one examines the physics of a cation leaking across a bilipid layer. Quantum mechanics is unlike the usual quantum mechanics of a lepton crossing a barrier. Space coordinates play little or no role in the analysis because the potential energy of the lepton doesn't change with position without crossing the barrier. What does change with time is the charge on the membrane. Very different from the situation of electron orbiting a nucleus. The resulting descriptive equations is rather complex.

11 *Electrochemical Sensors for Neurodegenerative Disease Detection*, **GAURAV CHATTERJEE**^{1*}, **SRIVATSA AITHAL**¹, **CLAIRE MCGRAW**², **SRINATH KASTURIRANGAN**², **MICHEAL SIERKS**² and **SHALINI PRASAD**^{1,3} (¹Department of Electrical, Computer and Energy Engineering, Arizona State University, P.O. Box 875706, Tempe, AZ 85287-5706; ²Department of Chemical Engineering, Arizona State University, Tempe, AZ, 85287-5706; ³Department of Electrical and Computer Engineering, Portland State University, Portland, OR 97201; Gaurav.Chatterjee@asu.edu).

Recent advances in proteomics research have resulted in the identification of a number of proteins that are potential biomarkers for disease diagnosis. These biomarkers when detected at ultra low concentrations can facilitate early diagnosis of diseases. The use of micro and nanotechnology tools has the potential to drastically transform the existing disease diagnostic processes.

Neuropathologic and genetics studies as well as transgenic animal models have provided strong evidence linking misfolding and aggregation of α -synuclein to the progression of Parkinson disease (PD) and other related disorders. A growing body of evidence implicates various oligomeric forms of α -synuclein as the toxic species responsible for neurodegeneration and neuronal cell death. Reagents that can interact with specific aggregate forms of α -synuclein would be very useful not only as tools to study how different aggregate forms affect cell function, but also as potential diagnostic and therapeutic agents for PD.

A label-free, electrochemical biosensor platform based on the generation of high density arrays of nano-scale confined spaces for confining protein bio-molecules was designed and developed. An electrochemical assay leveraging the micro array principle was designed through heterogeneous integration of nanoporous materials with microelectronic circuitry. A layer by layer chemistry was employed to conjugate the protein probes to the surface. Protein detection was achieved through measurement of impedance changes associated with the binding of the proteins to their capture probes. The biosensor was tested for neurodegenerative disease detection, with primary focus on Alzheimer's and Parkinson's disease.

The device was capable of detecting the proteins in femtomolar regime using very low sample volumes. These performance attributes make the biosensor platform an attractive candidate for point-of-care diagnostics.

12 *Apertureless Near-field Two-Photon Fluorescence Imaging with Continuous Wave Excitation*, **DEREK B. NOWAK**^{1*}, **A.J. LAWERNCE**¹, and **ERIK J. SÁNCHEZ**^{1,2} (¹Department of Physics, ²Department of Electrical and Computer Engineering, Portland State University, P.O. Box 751, Portland, OR, USA; dbn@pdx.edu).

Traditional light microscopy suffers from the diffraction limit, which limits the spatial resolution to $\lambda/2$. Near-field optical microscopes allow for imaging at resolutions lower than the diffraction limit. Using a combination of a shear force microscope (SFM) and an inverted optical microscope, resolutions of 10s of nanometers have been demonstrated. The imaging probes for the SFM are specially shaped metal tips that are illuminated with the excitation light. This technique has been named tip enhanced near-field optical microscopy (TENOM). The imaging contrast in the near-field can be improved using two-photon excitation techniques, which allow for a quadratic increase in the signal to background noise. Two-photon excitation uses two photons of roughly half the energy required, which must arrive one attosecond apart at the fluorophore, to generate a fluorescence event. The high-density of photons required for a two-photon transition is traditionally accomplished with a femtosecond mode-locked pulsed laser source. The cost and complexity of pulsed laser systems can place two-photon imaging out of reach at smaller research labs. We have demonstrated that the mode-locked source can be replaced with a low cost continuous wave diode laser. A discussion of a low cost system design, two photon filter selection, laser power levels needed, heating, and image contrast mechanisms are presented.

13 *Four Current Diverse Cosmological Anomalies and Their Common Cause*, **ROGER ELLMAN** (The-Origin Foundation, Inc., 320 Gemma Circle, Santa Rosa, CA 95404; RogerEllman@The-Origin.org).

Over the past 80 years, a succession of four different phenomena have been discovered, each of them appearing to be the result of an unaccounted-for acceleration that is: quite small,

centrally directed in the system exhibiting each phenomenon, non-gravitational, distance independent, and apparently of a common magnitude.

The present paper analyzes the four phenomena and proposes a common cause, a common solution to the problem that they present.

The four phenomena, in the order of their discovery are:

1 – In 1933, the indication by galactic rotation curves that there is such an acceleration present and acting in galaxies but with no observable cause [hence the postulating of “Dark Matter”]. Here the acceleration is directed toward the galactic center, the dominant factor in the mechanics of galaxy rotation.

2 – In 1998, the Pioneer Anomaly in which the acceleration is directed toward the Sun, the dominant factor in the mechanics of the Pioneer spacecrafts’ motion.

3 – In 2008, the Flybys Anomaly for which the acceleration is directed toward the center of the Earth, the dominant factor in the mechanics of the flyby motion.

4 – Also in 2008, confirmed in 2010, the Dark Flow anomaly for which the acceleration is directed toward the central origin of the overall universe, the dominant factor in the mechanics of the overall universe, where the Big Bang and expansion began.

14 *The Inside Track on Galactic Spiral Arms*, **ERIK ANDERSON** (360 Iowa Street, Ashland, Oregon 97520; erik@astrostudio.org).

Spiral galaxies are among the most beautiful and familiar objects in the heavens, but the reason why galaxies assume spiral forms has remained unsolved. I present a description of stellar orbits modeled as perturbed ellipses aligned at a focus in coordinates rotating at the rate of precession of apocenter (Francis & Anderson, Proc. R. Soc. A 465, 3425–3446). The model is demonstrated with animated simulations. Stars join a spiral arm just before apocenter, follow the arm for more than half an orbit, and leave the arm soon after pericenter. Spiral pattern speed equals the mean rate of precession of apocenter. Spiral pitch angle is directly related to the distribution of orbital eccentricities in a given spiral galaxy. From an investigation of the motions of 20,574 stars in the solar neighborhood, a new picture of the Milky Way emerges which indicates that our galaxy is a tightly wound “grand design” two-armed spiral – not a four-armed spiral as has previously been supposed.

15 *Dynamic Phase Diagram of the Semi-dilute CPyCl/NaSal Micellar System*, **PANOS PHOTINOS** (Department of Chemistry, Physics, Materials and Engineering, Southern Oregon University, Ashland, OR 97520; Photinos@sou.edu).

Rheological measurements on the micellar system cetylpyridinium chloride/sodium salicylate (molar ratio 1:1) in water are presented. The sample concentrations were in the semi-dilute range, between 15mM/15mM and 40mM/40mM. Flow curves in the cone-plate geometry and transient response on shear start-up are presented at temperatures of 20 °C, 25 °C and 30 °C. We observe a shear thickening region, which for the 20mM

sample at 20 °C in the stress controlled mode begins at shear rate of about 20 s⁻¹. The shear thickening part of the flow curve is preceded shear thinning. The threshold for shear thickening increases with increasing temperature and with decreasing concentration. The transients upon shear start-up are most prominent in the shear thinning region. The amplitude and relaxation time of the transients decrease with increasing temperature and decreasing concentration. The results are interpreted in terms of the micellar structure and viscosity of the aqueous phase.

Progress in Vaccine and Drug Development Monday, 8:30 a.m. in Science 275

16 *Construction and Characterization of an IsdA-Cholera Toxin A₂/B Chimera for Use as a Potential Intranasal *Staphylococcus aureus* Vaccine*, **JULIETTE K. TINKER¹* and **BRITNI M. ARLIAN²** (¹Department of Biological Sciences, Boise State University, 1910 University Drive, Boise, ID 83725; ²Department of Biology, The College of Idaho, 2112 Cleveland Boulevard, Caldwell, ID 83605; juliettetinker@boisestate.edu).**

Staphylococcus aureus represents a leading cause of nosocomial and community-acquired infection worldwide. This gram positive bacterium has recently emerged as a major public health threat because effective treatment options have become limited with its increase in resistance to broad spectrum antibiotics. The ability of *S. aureus* to cause a wide range of infections is the result of its extensive virulence factors including IsdA, a surface protein essential for colonization of *S. aureus* on human nasal epithelial cells. In the present study, we constructed and characterized a potential *S. aureus* subunit vaccine using a cholera toxin fusion to IsdA. A plasmid was constructed to express a non-toxic cholera toxin (CT) A₂/B chimera, containing the antigen IsdA from *S. aureus*, in transformed *E. coli*. Proper folding and composition of the IsdA-CTA₂/B chimera was verified by SDS-PAGE and Western blot. The B subunit of the chimera was confirmed by G_{M1} ELISA to retain its affinity to bind CT’s native receptor, G_{M1}, and therefore deliver IsdA to CT-sensitive cells. *In vitro* trafficking studies by confocal microscopy reveal IsdA-CTA₂/B binds to Vero cells and is endocytosed in a manner similar to native CT. In addition, female BALB/c mice were immunized intranasally with IsdA-CTA₂/B, followed by one booster immunization 10 days post-priming. ELISA analysis of IsdA-specific antibody responses of sera and feces and lymphocyte proliferation assay of mouse splenocytes stimulated with IsdA indicate intranasal immunization with IsdA-CTA₂/B induced systemic humoral IgA and IgG and cellular immunity, respectively. IgG induction by the chimeric molecule was superior to induction by IsdA antigen alone. Our findings suggest that further validation of the immunogenic properties of the IsdA-CTA₂/B chimera could facilitate its use as a vaccine candidate in humans for prevention of *S. aureus* systemic infection or nasal carriage.

17 Oncostatin M as a Potential Target for Inhibiting Breast Cancer Metastasis, **CHERYL L. JORCYK** (Department of Biological Sciences, Boise State University, Boise, ID 83725; cjorcyk@boisestate.edu).

Oncostatin M (OSM) is a pleiotropic cytokine in the interleukin (IL)-6 family with a function in inflammation. In cancer, OSM inhibits the proliferation of breast tumor cells *in vitro* and was previously evaluated as a potential cancer therapy. Evidence from the literature and our preliminary data; however, suggest that OSM may promote metastasis of breast cancer cells and stimulate the formation of bone metastases. We have shown that OSM induces expression of several proteins known to participate in metastasis including proteinases, cyclooxygenase-2, vascular endothelial growth factor (VEGF), and hypoxia inducible factor 1 alpha. We have also demonstrated that OSM promotes the development of a metastatic phenotype in 66c14 and 4T1.2 murine mammary cancer cells *in vitro*. In the presence of OSM, the mammary cancer cells stimulate an increase in osteoclastogenesis. Additionally, we have co-cultured synthetic bone chips with mouse mammary cancer cells to look for stimulation of osteolysis in the presence of OSM. Our findings suggest that OSM may stimulate both the formation of osteoclasts and osteoclast activity. *In vivo* experiments addressing the role of OSM in breast cancer metastasis are underway. To date, there are no therapeutics that inhibit OSM signaling to reduce osteolytic burden, and our findings suggest that inhibiting OSM may have a positive effect on osteolytic breast cancer metastases. Funding by NIH P20RR16454 and ACS RSG-09-276-01-CSM.

18 Role Of Monocyte Chemoattractant Protein (MCP)-1 During Liver Regeneration, **KRISTEN A. MITCHELL** (Department of Biological Sciences, Boise State University, Boise, ID 83725-1515; kristenmitchell@boisestate.edu).

Liver regeneration is a complex process in which cytokines and growth factors stimulate hepatocyte proliferation. During the early, priming phase of liver regeneration, macrophages become activated and produce cytokines that initiate hepatocyte cell cycle progression. We recently found evidence that liver regeneration is impaired in the absence of monocyte chemoattractant protein (MCP)-1, a proinflammatory chemokine that recruits monocytes/macrophages to areas of injury. We are currently exploring the role of chemokines in recruiting and activating macrophages, as well as other nonparenchymal cells in the liver, such as hepatic stellate cells. We hypothesize that chemokine production is essential for promoting the activation of nonparenchymal cells and that, in the absence of chemokines, these cells fail to produce the cytokines and growth factors needed to drive hepatocytes out of quiescence and into the cell cycle. We anticipate that results from these studies will shed light on the intricate role of inflammation in modulating liver regeneration. They may also provide a rationale for developing therapeutic strategies to modulate chemokine signaling pathways to promote recovery from liver disease.

19 DockOmatic: Automating Autodock for Ligand to Receptor Binding Prediction, **OWEN M. MCDOUGAL*** and **REED B. JACOB** (Department of Chemistry and Biochemistry, Boise State University, Boise, ID 83725; owenmcdougal@boisestate.edu).

Predicting ligand to receptor binding efficiency using the computer program Autodock 4 has provided a cost effective means to identify promising drug candidates. Autodock uses a Lamarckian Genetic Algorithm (LGA) to calculate the free energy of binding for the ligand to the receptor. While the docking of the ligand to the receptor is automated, the submission of ligands to be docked against specified receptors and the ranking of results consists of time consuming manual manipulation by the user. DockOmatic was developed to address both of these issues with Autodock. This presentation will describe the measures that have been put in place to automate Autodock and a specific example of how the program works.

20 Possible Requirement for *Borrelia burgdorferi* protein(s) Encoded within the *bba01-bba07* Region of *lp54* in Establishing Mammalian Infection by Tick Bite, **AARON BESTOR***, **PHILIP E. STEWART**, **MOLLIE W. JEWETT**, **AMIT SARKAR** and **PATRICIA A. ROSA** (Laboratory of Zoonotic Pathogens, Rocky Mountain Laboratories NIH/NIAID, 903 S. 4th Street, Hamilton, MT 59840; bestora@niaid.nih.gov).

The genome of *Borrelia burgdorferi*, the causative agent of Lyme disease, consists of a linear chromosome and up to 21 linear and circular plasmids. One of the most highly conserved plasmids in the *B. burgdorferi* genome is the linear plasmid *lp54*. Several genes on *lp54* are critical for *B. burgdorferi*'s survival throughout the infectious cycle, yet the function and/or requirement for the majority of the 76 proteins encoded on this plasmid are unknown.

To identify genes encoding proteins that are essential for survival of *B. burgdorferi*, we utilized the *Cre-lox* recombinase system to delete the first seven genes on *lp54*, *bba01-bba07*. Although this mutant, A3ΔA1-7, could infect mice by needle inoculation, infection by tick bite appeared to be attenuated since only half of the mice were infected by tick transmission when challenged with 20 ticks per mouse. When only 5 infected ticks were fed per mouse, none of the mice were infected, confirming the defect in infectivity by this route. Further studies suggest that deletion of one or more genes in this region of *lp54* may lead to a defect in the adaptive response of *B. burgdorferi* to the blood meal.

We are currently deleting individual genes in the *bba01-bba07* region to further investigate their requirement and possible function during the infectious cycle of *B. burgdorferi*. Identifying the protein(s) involved in transmission is crucial for increasing our understanding of how *B. burgdorferi* cycles between its tick vector and mammal hosts.

21 *Metabolic and Proteomic Analyses of MTN Deficiency Reveal Potential Mechanisms of Action and Targets for Antibiotic Development*, **KEN CORNELL***, **SETH EIDEMILLER**, **TONY MARTINEZ**, and **OWEN McDOUGAL** (Department of Chemistry and Biochemistry, Boise State University, Boise, ID 83725-1520; kencornell@boisestate.edu).

5'-Methylthioadenosine/S-adenosylhomocysteine nucleosidase (MTN) is a microbe and plant specific enzyme important in salvaging the purine and methionine components of S-adenosylmethionine that are consumed in a variety of metabolic reactions such as autoinducer formation, methylation reactions, polyamine and vitamin synthesis. Pharmacologic or genetic blockades of MTN activity in *E. coli* lead to marked changes in carbon utilization patterns, growth rates, and autoinducer signaling dependent events. Proteomic and metabolomic studies indicate alterations exist beyond purine and methionine pathways, and extend into central carbon metabolism through interruption of thiamine, lipoate, and biotin dependent enzyme activities. These investigations are elucidating adaptive responses in MTN deficient organisms, and suggest potential mechanisms of action that will be exerted by anti-MTN specific drugs. Further, the results of the biochemical and in vitro studies suggest that MTN inhibitors are potential chemotherapeutic agents that may function best as adjunctive therapies to improve the efficacy of standard antibiotics.

Science and Art Consilience

Monday, 1:30 p.m. in Science 171

22 *Living and Learning in the Intellectual Borderland (Part 1)*, **DIANE E. ULLMAN^{1*}** and **DONNA BILLICK²** (¹Professor of Entomology, Co-Founder and Co-Director of the UC Davis Art/Science Fusion Program, Associate Dean for Undergraduate Academic Programs, College of Agricultural and Environmental Sciences, Office of the Dean, University of California Davis, 1 Shields Ave, 150 Mrak Hall, Davis, CA 95616; deullman@ucdavis.edu; ²Co-Founder and Co-Director of the UC Davis Art/Science Fusion Program, Program Representative, Department of Plant Pathology, University of California Davis, 1 Shields Ave, 150 Mrak Hall, Davis, CA 95616, Owner and Director of Billick Rock Art, Board of Directors for Tile Heritage Foundation. Owner and Director of Todos Artes, Baja Mexico; rockartus@aol.com).

A planet in crisis, up to 50,000 species lost each year, biodiversity and human diet threatened by collapse of our major pollinators—never has there been more need to educate people to think in creative new ways, to collaborate and to integrate knowledge for novel solutions. The focal point of Part 1 of this collaborative presentation reveals how the Art/Science Fusion Program connects minds and hands to create intellectual and visual literacy. What would happen in a classroom if we brought the common elements of art and science together? Would artists better access scientific literacy? Would scientists better access art as a means

of expression? Would the connections created inform artistic and scientific inquiry? Would a forum for collaborative learning, where teachers become learners and learners become teachers, emerge? Our learning outcomes data show that the art/science fusion paradigm creates accessibility, inclusion and a new level of cognitive success for people that would otherwise fear science, or fear art. Creative fires are stoked and expression within the classroom creates value and a shared meaning system. Not only does the paradigm provide a new and innovative classroom learning experience, it creates collaborations between diverse students and the community. Learning outcomes for university students are extended to K-12 students and life-long learning for the public. Stimulating the mind, invoking the senses, stretching integrative abilities - the unexpected similarities at the intersection of art and science create an intellectual borderland where a new kind of literacy is offered to people of all ages.

23 *Living and Learning in the Intellectual Borderland (Part 2)*, **DONNA BILLICK^{1*}** and **DIANE E. ULLMAN²** (¹Co-Founder and Co-Director of the UC Davis Art/Science Fusion Program, Program Representative, Department of Plant Pathology, University of California Davis, 1 Shields Ave, 150 Mrak Hall, Davis, CA 95616, Owner and Director of Billick Rock Art, Board of Directors for Tile Heritage Foundation, Owner and Director of Todos Artes, Baja Mexico; rockartus@aol.com; ²Professor of Entomology, Co-Founder and Co-Director of the UC Davis Art/Science Fusion Program, Associate Dean for Undergraduate Academic Programs, College of Agricultural and Environmental Sciences, Office of the Dean, University of California Davis, 1 Shields Ave, 150 Mrak Hall, Davis, CA 95616; deullman@ucdavis.edu).

Our Art/Science Fusion program, a 10 year experiment into experiential, hands on, project-based teaching and learning, offers a breakthrough approach to education. We jump the fence and cross traditional borders to bring collective learning strategies to the classroom, into the community, shaping the personal mind and heart space. The focal point of Part 2 of this collaborative presentation will reveal the experiential, project-based part of our work and the essential connections between art and science. Opening and entering a new territory of inspired thinking about contemporary issues happens through the connection between formal lectures and hands-on visual literacy that abounds in a creative environment called the Labudio (lab + studio). I will describe precisely with images and video, how the Labudio experience creates a foundation for this new paradigm of Art/Science Fusion – from environmental literacy elements, to design, fabrication and installation of large scale public art on the UC Davis campus. Project #1. Nature's Gallery, the UC Davis Arboretum, Ruth Storer drought tolerant plant garden was the focus for our 8' x 26', project showcased at the US Botanic Garden in Washington D.C. Project #2 will include a video of Honey Bee Haven, a magnificent honey bee pollinator garden, currently being developed at the UC Davis, Harry Laidlaw Honey Bee Research Site. Both projects included undergraduate students,

K-12 outreach and a community build component staged in the Labudio. We invite all interested art/scientists to share in this successful experiment by exploring the nuts and bolts of how it is done.

24 *Art and Science: Bridging the Two Cultures through Photography*, **TERRENCE R. NATHAN** (Atmospheric Science Program, Department of Land, Air and Water Resources, University of California Davis, One Shields Ave, 239 Hoagland Hall, CA 95616; trnathan@ucdavis.edu).

Since Louis Daguerre “imprisoned” light more than 160 years ago, photography has been embraced by both art and science. Beginning with centuries-old experiments in optics and chemistry to the present-day digital revolution, the camera not only has relied on science for its development, it has been an essential scientific tool for probing and documenting the natural world. In the hands of the artist, the camera has heightened our awareness of the aesthetic qualities of space and light while revealing hidden truths about culture and society.

My presentation will consist of three parts. In the first part, I will provide a historical overview of photography’s role in art and science, ranging from Darwin’s use of art and photography in the theory of evolution in the nineteenth century to Berenice Abbott’s aesthetically captivating photographs of physical principles in the twentieth century. In the second part, I will show how the Art/Science Fusion Program at UC Davis is employing photography to engage students in the art-science dialogue, addressing such topics as the geometrical foundations of art and science and the application of Einsteinian physics to photographic composition. And in the third part, I will present some of my own work, where I explore the borderland occupied by Kantian aesthetics and Newtonian mechanics, a region where universal qualities shared by both art and science are brought to light by the fleeting sculptures formed in whiffs of smoke and fixed in a photograph.

25 *How They Learned Science By Singing About It*, **WENDY K. SILK** (Department of Land Air and Water Resources, University of California at Davis, One Shields Ave., Davis CA 95616; wksilk@ucdavis.edu).

In 2008 the course “Earth, Water, Science, Song” was introduced to the ArtScience curriculum at the University of California, Davis. The class required students to write and perform songs to communicate their understanding of the lectures and readings in environmental science. Instruction featured conventional science lectures, participation of guest artists from the community, and studio sessions on music theory, songwriting, and performance skills. The hope was that the act of translating from science lectures to an art form would foster understanding of the science. Assigned topics for songwriting included the hydrologic cycle, the carbon cycle, the nitrogen cycle, spatial and temporal variation, ground water, surface water, soil formation, eutrophication, photosynthesis, and transpiration. Instead of writing a final exam the students performed in a university

lecture hall and in a local art gallery. A spirit of intense collaboration appeared to develop with the collaborative work among musicians and music neophytes, science majors and non-majors. The repetition involved in rehearsals also seemed to foster learning and content retention. Student evaluations were enthusiastic. Input is sought on valid ways to assess the educational impact of this approach to teaching science.

26 *Creativity: The Nexus of Art and Science*, **ANN E. SAVAGEAU** (Design Department, University of California, One Shields Avenue, Davis, CA 95616; aesavageau@ucdavis.edu).

“One of the common themes running through the education of all creative people is an early experience with the creative process itself. It doesn’t matter whether it’s in poetry, music, painting, crafts, inventing, or science itself”. This quote from scientist Robert Root-Bernstein highlights creativity as the nexus between art and science. The creative process, whether in art or science, is at the core of each.

Both art and science are ways of approaching nature. Nature raises questions that both art and science seek to study and answer. They use different but complementary approaches that serve to enhance our understanding. I use my creative work with natural materials to illustrate the similarities between the creative process in art and science. I describe my process of artistic creation and point out its similarity to the process of evolution in terms of recombination and selection. I discuss what Bernstein calls “the tools of thought” such as pattern forming, modeling, analogizing, and aesthetics, which are used by artists and scientists alike.

My goal is to create a new aesthetic based on nature and natural processes, in contrast to the prevailing contemporary aesthetic based on the industrial age. This new aesthetic is more in line with similar trends in science and the new emphasis on an integrative systems approach, in contrast to the twentieth century reductionist emphasis. I will illustrate these themes with numerous examples from my recent work with mixed media incorporating such diverse natural materials as cacti, seeds, bones and hornet nest paper.

27 *Windows Into the Unimaginable*, **CATHERINE CHALMERS** (Independent Artist, 35 Wooster Street, New York, NY 10013; cgchalmers@hotmail.com).

Insects are a window into the unimaginable. Their biology and behaviors are routinely bizarre and enigmatic to us – they are refreshingly outside the human perspective. Our experience can be enhanced by an attempt to understand and give meaning to other life forms. Yet, is it possible that a human-centric viewpoint is setting the stage for an impoverished environment? I will be showing a selection of artwork from projects that delve into this question - Food Chain, American Cockroach, and The Leafcutters. My discussion will be interwoven with philosophical, aesthetic and practical aspects of being an artist whose main collaborators are live animals. For years I raised my plant and animal co-authors in my New York City studio, but for my new

series with leaf cutter ants I am on site in Costa Rica. My work focuses on our complex and often troubled relationship to the natural world and I am most interested in the animals, such as insects, whose behavior and form are so different from our own. The presentation includes photography, drawing and sculpture, and I will also screen three short videos – “Squish,” a cockroach ballet, “Safari,” an urban cockroach’s return to the wild, and “We Rule,” an ant colony’s creative leaf cutting. Throughout history, dominance begets hubris, the language of which humans have used to heighten divisions and impress superiority across tribes, cultures and nations. With these works I borrow that language and use it as a metaphor for the relationship between humans and the natural world today.

28 *Science and the Arts: Rethinking the Liberal Arts Curriculum*, **PRAKASH R. CHENJERI** (Department of Language, Literature, and Philosophy, Southern Oregon University, 1250 Siskiyou Blvd., Ashland, OR 97520; chenjeri@sou.edu).

“The world henceforth will be run by synthesizers, people able to put together the right information at the right time, think critically about it, and make important choices wisely.” This is one of the claims E. O. Wilson boldly makes in his 1998 provocative book *Consilience*. My presentation will subject this claim to a philosophical critique and speculate on its potential for re-visioning and revitalizing a new liberal arts curriculum. I will do this in three parts, albeit only briefly: I will first discuss an epistemological question—does natural science’s historical commitment to methodological naturalism present problems for any attempt to synthesize the sciences and the arts? Drawing on examples from natural science as well as the arts—genetics, physics, art, and literature—I will highlight some of the challenges that the new synthesis will have to meet. Next I will explore the issue of the subjective and objective connotations typically attributed to the arts (and humanities) and the sciences, respectively. For example, in the new paradigm, will this lead to redefining, perhaps even blurring, of boundaries between disciplines? How will this affect the practice and appreciation of the arts and sciences? I will use examples to bring these questions to life. In the final part of the presentation, I will speculate on the normative implication of my two previous lines of thought and offer some suggestions, including a prototype syllabus, for what this might mean for a revision of higher education liberal arts and sciences curriculum in light of the new paradigm.

**New Humanities and Science Convergences:
Science-Humanities Cross Fertilizations
Tuesday, 8:30 a.m. in Sc 275**

29 *Something the Sun Suck’d Up: Malaria as Portrayed in Shakespeare*, **BARBARA YABLON MAIDA** (Department of Geography, University of California Los Angeles, 1255 Bunche Hall, Los Angeles, CA 90095; bymaida@ucla.edu).

When examining the history of disease, lack of a clear

written record often causes the greatest frustration. Though Britain does not suffer from a dearth of printed evidence, parish documents are the frequent source of data from the Elizabethan Age. Demographic and climatic trends may then be corroborated, leading to quantitative assumptions. While this allows for a sense of crude physical context surrounding specific causes of death, parish boundaries alone do not illuminate the human aspect of disease. The integrated environment, including *eigen-place* emphasizes the notion of belonging to a place. While all evidence points to *Plasmodium vivax* as the cause of so much death in the temperate marshlands of southeastern England, this is counter-intuitive; it is *P. falciparum* which bears the monikers of *pernicious* and *malignant*. Shakespeare’s personal health history and the way he wrote of disease in general yield the impression that malaria was more than an individual agent, vector or host. Science historians have the advantage of Daniel Defoe’s journals, and especially the musings of Shakespeare’s characters; here is the elusive human aspect, the belonging of a species or a disease to a place. Deeper than the simple metaphor of *ague-as-wickedness*, the plays communicate not only valuable symptomatic information, but reveal the changing medical viewpoints of the time. Here, at the intersection of environment and disease, is the relationship of individual to nature. In this light, Shakespeare could be considered one of the early literary medical geographers.

30 *Training for Life: Dewey, Experimentalism, and the Great Transformation in Schooling*, **CARL A. MAIDA** (University of California, 63-037 Center for the Health Sciences, Los Angeles, CA 90095; cmaida@ucla.edu).

Progressive philosopher and educator John Dewey, who founded an experimental school in Chicago in 1897, envisioned the school as having features similar to a workshop and laboratory endowed with tools, ones that children could use to create, construct, and experiment, hence becoming active inquirers. For Dewey, the classroom was a “miniature community” where play was integral to learning social roles and actively engaging with the physical environment. Dewey viewed the school as providing students “with the instruments of effective self-direction,” tools that would help them to gain greater control over their cognition and social behavior, and over their social and physical environments. For Dewey, social reconstruction could only occur after individuals used scientific inquiry to reflect upon their experience and to understand the social consequences of their behavior. Hence, it is only in and through a “community of inquirers,” such as the progressive school, that cognitive processes for regulating human behavior could be developed and tested. Dewey’s progressive school was a setting where rules, based on such experientially derived knowledge, were socialized and used to guide further inquiry, presumably for community betterment. Dewey’s educational ideas, especially the notion of the school as a “social laboratory,” inspired teachers and influenced educational policy in the first decades of the twentieth century when the United States underwent a “great transformation”

in its educational history, toward mass schooling, resulting partly from the “high school movement” where the focus was “schooling for life.”

31 *The Wildman: Representation of An Archetype in Popular Perception*, **D. JEFFREY MELDRUM** (Department of Biological Sciences, Idaho State University, 921 S. 8th Ave., Pocatello, ID 83209; meldd@isu.edu).

Popular perception of the iconic figure of the wildman of the woods has been influenced immensely by its rendering in artistic representation. It’s characterization has evolved, and vacillated, from an image of a denizen of the dark fringes of frontier, to the imperiled vicar of humanity’s link to wilderness. Notable parallels with the evolution of popular perception of our nearest animal kin, especially the gorilla, are directly relevant. Beginning with native beliefs and early explorer’s narratives of horrific encounters and abductions, the gorilla’s image morphed from “the most terrifying creature on Earth,” as billed by Barnum & Bailey, to the contemporary concept of the endangered species, the poster-child relic of the vanishing tropical forests. Similarly, depictions of extinct hominins such as the neanderthals have morphed as societal notions and political correctness of exclusivity and inclusivity have evolved. The beastilization or humanization of the wildman reflects not only the accumulation of scientific data, but also the contemporary interpretive filter of human society.

32 *Evolution and the Fate of Humanity*, **LAWRENCE H. WOOD** (Physicist, Retired, 8433 Camano Loop NE, Lacey, WA 98516; marylar@comcast.net).

This paper draws upon my recently published book, *Evolution’s Fatal Flaw*. Although the Pacific Division of the AAAS has addressed the Evolution controversy in the past, e.g. the 1984 meeting, the controversy is unfortunately alive and well.

My book takes a unique approach to the issue of evolution’s validity to unequivocally establish this validity; however, this has also been more-or-less accomplished by others, most recently by Richard Dawkins; accordingly, due to presentation time constraints, this paper will assume Evolution’s validity and concentrate on two aspects of Evolution that I believe have not been adequately covered elsewhere: Why Evolution is the inevitable consequence of the requirement to ensure species survival, and Evolution’s Fatal Flaw, which is not a Flaw in Evolution, but the result of Evolution’s successful selection of behavioral traits that ensures species survival. Unfortunately, these behavioral traits also lead to the propensity for species populations to expand until all resources are consumed. In view of the current trend in human populations, Evolution’s Fatal Flaw presents potentially serious consequences for the fate of humanity.

This paper will explain why Evolution is the inevitable consequence of the requirement to ensure species survival, and reveal the details of Evolution’s Fatal Flaw, a novel aspect of Evolution not heretofore disclosed. I believe this paper presents an important message that should interest all attendees at the

June 2009 meeting.

33 *Art and Ecology in Jonathan Fisher’s A Morning View of Blue Hill Village 1824: “The Full Adjusted Harmony of Things,”* **ROBERT LOUIS CHIANESE** (2465 Hall Canyon Road, Ventura CA 93001-2467; robert.chianese@csun.edu).

Jonathan Fisher’s painting, *A Morning View of Blue Hill Village, 1824*, depicts a growing settlement in the Maine woods where human and natural domains seem compatible, an early vision of ecological interdependence. The eclectic Fisher (1768-1847)—American painter, poet, preacher and amateur naturalist—brings together his often contrary interests in religion, science, and romantic ideality, not only in his landscape art but in his poetry and nature writings. These provide support for his prescient depiction of interdependent, non-hierarchical models of the world in *A Morning View of Blue Hill Village* that prefigure modern environmental consciousness.

34 *Does Art Matter, and If So, Why? An Artist Turns to an Ethnologist for the Answers*, **SHOSHANAH DUBINER** (1330 Evan Lane, Ashland, OR 97520; sdubiner@cybermuseum.com).

Art matters; indeed, it matters profoundly. One unique attribute of human beings is that they have always danced, sung songs, painted and carved images, and told stories—performed activities that we loosely call the arts. The arts serve the basic emotional needs and motivational structures of the human body and mind, with roots going deeper than individual creativity and cultural constructs. Scientists, such as anatomist J.Z. Young, experimental psychologist and cognitive scientist Steven Pinker, professor of neuroesthetics Semir Zeki, and Darwinian ethologist Ellen Dissanayake all investigate the role of the arts in human evolution.

Dissanayake does not focus on what makes “great aesthetic works timeless” to prove her case for the arts as an “evolved component of human nature, a biological proclivity of evolutionary origin and adaptive functions.”

Rather, she focuses on arts in preliterate small-scale societies—the kind of societies our ancestors evolved in until quite recently—and proposes that “making special” is the common denominator of all those diverse activities, where ordinary experiences (e.g., ordinary objects, movements, sounds, utterances, surroundings) are made extraordinary through formal shaping, embellishing, enhancing. This making special is pleasurable and gratifying to human beings: “It is not art, but *making special* [via the arts] that has been evolutionarily important.” The arts helped human beings cope with uncertainty and strong emotions; they created feelings of caring, belonging, and identity in individuals and groups, thus contributing to the survival or reproductive success of the species.

Citizen Science: Integrating Biophysical and Social Realities in the Management of the Ashland Watershed

Tuesday at 8:30 a.m. in Science 108

35 *Functionality of the Siskiyou Mountain Ecosystem*, **THOMAS ATZET**. (Atzet Ecological Consulting, Box 1226, Merlin, OR 97532; jatzet@budget.net).

Robert Whittaker's 1960 Ecological Monograph article acknowledged the Siskiyou Mountains as the most floristically rich and environmentally diverse range in North America. As the source of genetic diversity for much of the west, the Siskiyou have what Dr. Whittaker called "central significance". Species migrated in all directions populating adjacent landscapes as the Klamath terrain swung into its current latitude. Driven partly by climate change many species returned "home" bringing in new and altered genes. This dynamic process frequently repeated itself over the millennia making the Siskiyou a source and a sink for genetic material and centrally significant evolutionary force.

However, fire suppression, public policy since the turn of the century, has altered current vegetation structure and composition, and has disrupted major processes such as regeneration, mortality, growth, and recycling. Early seral species and communities, that depend on disturbance to reproduce are less liberally scattered throughout the landscape. Growth into larger diameter classes once stimulated by fire mortality (reduction in density) has been retarded. Retarded growth has made larger, older trees more susceptible to insects and diseases. In general, these changes have made our landscapes less resilient and sustainable. The footprint of fire, which is becoming less frequent and more intense, may magnify the long-term effects of climate change, leaving the Siskiyou less able to act as a significant evolutionary screener in the future.

36 *Fire History of the Ashland Watershed*, **THOMAS SENSENIG** (Southwest Oregon Area Ecologist USFS, Medford Interagency Office, 3040 Biddle Road, Medford OR 97504; tsensenig@fs.fed.us).

Frequent fire has been sculpting the landscape vegetation and influencing the ecology of the Ashland Watershed for at least 6,000 years. Fire, the most ecologically significant disturbance, influences species composition, stand structure and habitat. This presentation will discuss the results of recent studies of the history and role of fire in the Ashland Watershed and the surrounding Siskiyou Mountains dating back to about 1350.

37 *Wildlife Response to Fuels Reduction Activities Research in the Ashland Watershed*, **DAVID CLAYTON** (Forest Wildlife Biologist, Rogue River-Siskiyou National Forest, 3040 Biddle Road, Medford, OR 97530; dclayton@fs.fed.us).

There has been little research conducted on the effect of fuels reductions activities to late successional species such as the spotted owl and Pacific fisher, two rare species known to occur in the Ashland Watershed. I will discuss the ecology and habitat

requirements of the two species as they relate to the Ashland Forest Resiliency Project (AFR), assumptions used in the Forest Service's effects analysis for the project, and ongoing research into the response of these species to proposed fuels reduction activities in AFR.

38 *Economic Valuation of Forested Watersheds and Applicability to the Ashland Forest Resiliency Project*, **JOHN J. GUTRICH** (Department of Environmental Studies, Southern Oregon University, 1250 Siskiyou Boulevard, Ashland, OR 97520; sturtevant@sou.edu).

This talk addresses environmental and ecological economic valuation of forested watersheds indicating how economic analysis can inform the public process of forest management. Highlighted with case studies, a review of methods applied to estimate the value of market and non-market forest ecosystem goods & services is discussed. The potential applicability of economic valuation to the Ashland Forest Resiliency Project is analyzed considering benefit-cost analysis, cost-effectiveness approaches and the incorporation of forest ecosystem goods and services into decision-making and management.

39 *US Forest Service Role in Integrating Biophysical Realities: The Ashland Forest Resiliency Stewardship Project*, **DON BOUCHER** (Siskiyou Mountains Ranger District, 645 Washington Street, Ashland, OR 97520; dboucher@fs.fed.us).

The recent signing of a stewardship agreement between the U.S. Forest Service, the City of Ashland, The Nature Conservancy, and Lomakatsi Restoration Project signals that implementation of the Ashland Forest Resiliency Stewardship Project is underway. Thinning of trees and brush and prescribed burning are the primary tools that will be used to reduce the risk of large-scale wildlife and provide protection to Ashland's domestic water supply. This talk will focus on the many biophysical issues within the Watershed and how they were incorporated into project design.

40 *Forest and Resource Management in the Ashland Watershed: The Historical Context*, **MARTY MAIN** (Consulting and Contracting Forester, Small Woodland Services, Inc., 2779 Camp Baker Road, Medford, OR; mmain3@mind.net).

There has been a long history of active citizen interest in the management of the Ashland watershed, particularly within the last 15 years. The watershed is owned by two landowners- the US Forest Service and the City of Ashland. Each has its own unique governmental, operating and regulatory environment. This talk will focus on how management actions and decision making has changed over time on the two ownerships in the watershed, with the culmination of a joint effort, with several other partners, in the current Ashland Forest Resiliency Project.

41 *Multi-Party Monitoring to Build Community Support for AFR*, **DARREN BORGAS** (The Nature Conservancy, 33 North Central Avenue, Suite 405, Medford, OR 97501; dborgias@tnc.org).

Stakeholders collaboratively developed a monitoring plan for the Ashland Forest Resiliency Stewardship Project in a community process starting in 2004. The project goals, standards, and guidelines focused monitoring on effectiveness in achieving desired modeled fire effects and ecosystem function in representing successional states and habitat types, and tree health and vigor. With support of the National Forest Foundation we gathered values and priorities from a range of interested stakeholders and integrated them with ongoing or planned Forest Service monitoring. Stakeholders elevated science delivery, called for close monitoring of implementation, and called for research on fire history. Stakeholders placed priority for supplemental monitoring on the delivery of clean water, retention of large trees and recovery of their vigor, late successional and riparian habitat conservation, protection for soils, herbaceous community recovery, and bird community response. A monitoring oversight committee called for social monitoring. Priorities and a budget for collaborative monitoring were developed. The project is moving forward with the input of the monitoring multiparty oversight committee, and a technical stakeholder implementation review team. A project database, web site, and a slate of events for public review have been established to provide transparency and involvement. The plan helped to prioritize and coordinate monitoring effort and fundraising priorities. The project cooperators anticipate that multiparty monitoring will help partners and stakeholders to advance their commitments and values in the stewardship of the watershed.

42 *What did we learn?: An Assessment of AFR's Summer 2009 Multi-party Monitoring Process*, **MARK A. SHIBLEY** (Department of Environmental Studies, Southern Oregon University, 1250 Siskiyou Blvd., Ashland, OR 97520; shibleym@sou.edu).

In the summer of 2009, with a grant from the National Forest Foundation, The Nature Conservancy, City of Ashland, and US Forest Service partnered to further develop a multi-party monitoring (MPM) process related to the Ashland Forest Resiliency (AFR) Project. Extraordinary community input shaped AFR, and community support during planning depended on the adoption of a multi-party framework for monitoring implementation and project effectiveness. Using participant observation of stakeholder meetings and a survey of stakeholders, community leaders and local resource professionals, our work assessed the summer 2009 MPM process. We measured what people knew about the Ashland watershed, their perceptions of AFR, what their monitoring priorities are, and how these things changed in the course of a three month process. In short, most survey respondents view AFR as a reasonable and desirable fuel hazard reduction plan, and they think the multi-party monitoring process was credible, informative, transparent, inclusive and collaborative, with some exceptions. The implications of this assessment for subsequent MPM processes will be explored.

43 *Community Engagement in the Ashland Forest Resiliency Project*, **CHRIS CHAMBERS** (Ashland Fire and Rescue,

Ashland OR, 97520; chamberc@ashland.or.us).

Community engagement in resource management is often the last thing accomplished, if it's funded at all. Increasingly, agencies and companies are finding that working with a community up front and during a project cuts down on overall time and cost and creates a more well informed final product. Forest management in Ashland has been no different and the evolution from public information to public engagement has led to projects that would not have been dreamed of 20 years ago. The City of Ashland is leading community engagement for the AFR project, building on past success on several major projects.

44 *AFR Stewardship Project: Developing Implementation Capacity through Workforce Training Programs*, **MARKO BEY** (Lomakatsi Restoration Project, P.O. Box 3084, Ashland, OR 97520; marko@lomakatsi.org).

Lomakatsi Restoration Project shares a workable model of social and ecological forestry built over 15 years, through the development of a knowledgeable workforce with the ability to implement ecologically -based wildfire management treatments within a diversity of landscape conditions.

Several thousand acres of fire suppressed forests within LSRs were treated by Lomakatsi throughout southern Oregon, as part of 5 federal land stewardship projects. Lomakatsi's Ecological Workforce Training Program has provided hundreds of forest workers and timber operators with the necessary skills needed for the emerging stewardship forestry industry.

Within the AFR project area, the complexity of conditions in this fire-adapted landscape creates a challenging environment for developing and implementing site-specific treatments.

Building an ecologically knowledgeable workforce with the ability to interpret complex silvicultural prescriptions, read the landscape, and implement a diversity of operational plans, will require training. Under standard contracts, most workers and crew bosses are asked to follow uniform prescriptions across each unit, and often throughout an entire project. This will not be the case with AFR.

Forest stands within the AFR project area vary in a multitude of ways, from moist sites to dry sites, low to high elevation, upslope to riparian, and across several different plant associations, age and size classes in treatment areas with different management objectives. Workers will be moving from one to the other following different prescriptions in each.

With a trained workforce, chances for accomplishing positive end results on-the-ground will be greater, thus contributing to positive support and acceptance for the AFR project.

45 *A Broad Look at Multi-party Monitoring and Community Collaboration*, **VICTORIA STURTEVANT** (Department of Environmental Studies, Southern Oregon University, 1250 Siskiyou Boulevard, Ashland, OR 97520; sturtevant@sou.edu).

Community-based, multi-party monitoring is becoming used widely to assess the impacts of alternative forest restoration activities, address conflicting goals among stakeholders,

and build adaptive communities. This presentation explores the promise of community-based monitoring in the Ashland Watershed by drawing on a study of 18 collaborative projects in the United States. This study, conducted as part of an evaluation of community-based forestry organizations supported by the Ford Foundation, found that collaborative monitoring can lead to shared ecological understanding among diverse participants, build trust internally and credibility externally, foster social learning and community-building, and advance adaptive management. The groups experienced challenges in recruiting and sustaining community participation in monitoring, building needed technical capacity for monitoring, and communicating monitoring results back to the broader community. These findings suggest that involving diverse interests at key points in the monitoring process can help advance social learning, while also strengthening the link between social and ecological systems by improving the information base for management and increasing collective awareness of the interdependence of human and natural forest communities.

46 *Needing Conflict for Fire Resiliency*, **JOEL T. KING** (District Ranger, Wild Rivers Ranger District, Rogue River-Siskiyou National Forest, 2164 N.E. Spalding Avenue, Grants Pass, OR 97526; jtking@fs.fed.us).

Public conflict and controversy concerning fire issues on public forests in the western U.S.—a democratic republic—have been ongoing for the last 100 years. These conflicts, if properly managed, can produce the change necessary in having fire-resilient forests. I will present an example from the Wild Rivers Ranger District, Rogue River-Siskiyou National Forest of one process for managing conflict to produce the best outcomes. This collaborative process has been developing over 10 years.

47 *Collaborative Design: Indicators and Landscape Assessments as a Means Toward Forest Restoration*, **GEORGE MCKINLEY** (Coordinator, Southern Oregon Small Diameter Collaborative, 13401 Hwy 66, Ashland, OR 97520; collaborative@jeffnet.org).

Forests in southwest Oregon have been impacted by an historic legacy of land-use decisions, past management and fire suppression. In many cases, the cumulative effect of these legacies has created a need and opportunity for forest restoration. However, shared goals and approaches for restoration have often been difficult to achieve. The use of collaboratively designed indicators has emerged as a tool to foster shared perspectives related to forest restoration goals. Landscape assessments that utilize a similar collaborative process have also proven useful in identifying a priority treatment landscape based upon recognized need and distinctive forest characteristics. This presentation will discuss the role of indicators and landscape assessments in implementing socially supported landscape-scale restoration treatments.

48 *Public Land Management for Community Health, How Far Do We Go?* **KEVIN PREISTER** (Center for Social Ecology and Public Policy, P.O. Box 3493, Ashland, OR 97520, kpreister@

jkagroup.com).

Legislation, executive policy, and social trends reinforce the importance of managing public lands for both biophysical and community health. Interest in community health is usually expressed in collaboration approaches, which mitigates the frequent controversies of public land decisions, and in management practices oriented to community health considerations derived from sound social and economic assessment. A brief review of accomplishments, pitfalls, and internal agency perspectives on these two institutional directions sets the stage to argue for Social Ecology as a science of community. When the science of community is brought to bear on both collaboration and social assessment, predictable outcomes are observed, notably, citizen ownership of planning and management outcomes, broadened resources to accomplish agency mission, and increased social capital. Case examples are presented which show federal land management agencies are poised for a significant paradigm shift in how they understand and work with communities.

49 *Integrating Science, Policy, and Local Knowledge*, **RICHARD A. WHITLEY** (Living Systems Consulting, 330 Wrights Creek DR., Ashland, OR 97520; Richard_Whitley3@msn.com).

The challenge created by the magnitude and speed of ecological, economic and social change occurring across the west can only be addressed with a combined effort from federal, state, and local government, private organizations and the communities most directly effected. In order to address this complex set of environmental, social, economic, organizational and political issues we will need to bring a whole new mind set.

The Progressive Era laid the foundations for “scientific management”. Yet scientific management lauded in concept has been elusive. Whose science, values, or interest, will influence funding and decisions? These conflicts result in restoration efforts being canceled or delayed and impacts our ability to maintain these import ecosystems and social and economic systems. The status quo is no longer OK.

We need to take a new tack, moving away from reliance on centralized, top-down approaches and towards a more flexible, multi-level approach. Based in the principles of adaptive governance which are designed to produce programs that adapt quickly and easily to new information and experimental results such an approach would encourage diversity and innovation in the search for solutions, while at the same time pointedly recasting the problem as one in which every culture and community has an inherent interest.

Anthropological Approaches to Environmental Change **Tuesday at 8:30 a.m. in Science 171**

50 *Female Reproduction History and Bone Health among Shuar and Colonos from the Ecuadorian Amazon: A Life History Theory Perspective*, **FELICIA C. MADIMENOS^{1,2*}**, **J. JOSH**

SNODGRASS^{1,2}, AARON D. BLACKWELL^{1,2,3}, MELISSA A. LIEBERT^{1,2}, and LAWRENCE S. SUGIYAMA^{1,2,3} (¹Department of Anthropology, ²Institute of Cognitive and Decision Sciences, University of Oregon, Eugene, OR; ³Center for Evolutionary Psychology, University of California, Santa Barbara, CA; fmadimen@uoregon.edu).

Bone mineral density (BMD) is the most important diagnostic parameter of bone health and a reliable predictor of future fracture risk. In addition to diet, female reproductive patterns—including parity, breast-feeding, and contraceptive use—affect change in BMD throughout the lifespan. However, understanding of how reproductive factors and life history trade-offs affect bone health is limited by a lack of data from natural fertility, non-western populations. We present the first such data, using calcaneal ultrasonometer to measure BMD among Shuar, an indigenous Ecuadorian population, which we compare with BMD among non-Shuar and colonos from the same area. BMD is analyzed by sex and age, and for women, reproductive history (age at first parturition, age of first menses, number of live births, reproductive and lactation status). Results suggest trade-offs between reproduction and bone integrity are complex but there remains a protective effect of pregnancy and lactation on skeletal health.

Support: Wenner-Gren Foundation for Anthropological Research; NSF # BCS-0925910; Leakey Foundation; UCSB Center for Evolutionary Psychology (via NIH grant number 5DP1OD000516-04); University of Oregon.

51 Effects of Diet and Household Economy on Growth and Health of Indigenous Shuar of Ecuadorian Amazonia, JULIA G. RIDGEWAY^{1,2*}, LAWRENCE S. SUGIYAMA^{1,2,3}, J. JOSH SNODGRASS^{1,2}, AARON D. BLACKWELL^{1,2,3}, FELICIA C. MADIMENOS^{1,2}, and MELISSA A. LIEBERT^{1,2} (¹Department of Anthropology, ²Institute of Cognitive and Decision Sciences, University of Oregon, Eugene, OR; ³Center for Evolutionary Psychology, University of California, Santa Barbara, CA; ridgeway@uoregon.edu).

While much of the world's population lives in market economies, precisely how these market integration has affected critical life history trade-offs (LHT) that impact health remain largely unknown, because so many factors have changed along with the transition to market economy. Such studies are critical however because our biology is largely adapted to pre-market conditions. Traditionally forager-horticulturalists, Shuar now experience a wide range of MI across their territory. Shuar children in communities close to towns have higher odds of stunting than more traditional, but closely related Shiwiari, suggesting MI has negative effects on Shuar growth. Here, we use factor analysis to reduce food frequency, style of life, and household economic variables, and to characterize the differences between remote and more market integrated communities. We use multiple regression to control for other factors (e.g., age, sex), while testing the association between market integration measures and growth and health outcome variables.

Supported by: NIH 5DP1OD000516-04 via the Center for Evolutionary Psychology, UCSB; NSF BCS-0824602; Wenner Gren Doctoral Dissertation Award; UO Summer Research Award; Ryoichi Sasakawa Young Leaders Fellowship Fund; UO Juda Research Grant; UO Department of Anthropology and Institute for Cognitive and Decision Sciences.

52 The Effects of Market Integration on Blood Pressure, Glucose, Cholesterol, and Triglyceride Levels in an Indigenous Lowland Ecuadorian Population, MELISSA A. LIEBERT^{1,2*}, J. JOSH SNODGRASS^{1,2}, AARON D. BLACKWELL^{1,2,3}, FELICIA C. MADIMENOS^{1,2}, and LAWRENCE S. SUGIYAMA^{1,2,3} (¹Department of Anthropology, ²Institute of Cognitive and Decision Sciences, University of Oregon, Eugene, OR; ³Center for Evolutionary Psychology, University of California, Santa Barbara, CA; liebert@uoregon.edu).

Increasing market integration can lead to changes in diet, as well as economic and social stresses that increase the risk of obesity, cardiovascular disease, and type 2 diabetes. The Shuar, an indigenous neo-tropical population from the Amazonian region of Ecuador, are experiencing a wide range of market integration. These conditions provide an important opportunity for examining the relationship between market integration and individual health status. Shuar economy was traditionally based on hunting, fishing, and horticulture. While some Shuar in remote areas east of the Cordillera de Cutucu continue to subsist primarily as forager-horticulturalists, most Shuar now purchase a range of market items and include some degree of agro-pastoralism in their productive activities. In the present study, we examine the association between measures of market integration (household food frequency, economic, and lifestyle measures) and several measures of cardiovascular and metabolic health. We collected anthropometric, health (fasting glucose, full lipid panel [LDL, HDL, total cholesterol, and triglycerides], blood pressure), and market integration data from 150 Shuar adults. Factor analysis was used to reduce measures of market integration, which we compare between remote communities and those close to town. Multiple regressions were then used to test the association between market factors and health measures, while controlling for other factors (e.g., age and sex). Results highlight the complex relationships between health measures, market integration, and diet under particular conditions.

Support: NIH #5DP1OD000516-04 (via Center for Evolutionary Psychology, UCSB); NSF BCS-0824602; University of Oregon; Ryoichi Sasakawa Young Leaders Fellowship Fund; Wenner-Gren Foundation.

53 Body Composition and Lifestyle Correlates of Stress Biomarkers among Latino Immigrants in Oregon, ERICA C. MIDTTVEIT^{1*}, HEATHER H. McCLURE^{1,2}, J. JOSH SNODGRASS¹, THOMAS W. McDADE³, CHARLES R. MARTINEZ², J. MARK EDDY², ROBERTO A. JIMENEZ⁴, and LAURA E. ISIORDIA⁴ (¹Department of Anthropology, University of Oregon, Eugene, OR; ²Oregon Social Learning Center, Eugene, OR; ³Department of Anthropology, Northwestern University, Evanston, IL; ⁴Farmworker Housing Development Corporation, Woodburn, OR; emidttveit@gmail.com).

High sensitivity C-reactive protein (CRP) is a biomarker of inflammation commonly used as a predictor of cardiovascular risk. In addition to associations with body composition measures, recent evidence shows associations between subclinically elevated CRP and psychosocial stress related to socioeconomic status (SES) and perceived discrimination. Little is known, however, about links among psychosocial stressors, stress buffers (e.g., social support), and elevated CRP among immigrants. The present study was conducted among Latino immigrant farmworkers in Oregon and included anthropometry, dried blood spots, and sociodemographic and lifestyle items. We analyzed CRP in relation to psychosocial stress and support among adult (≥ 18 years) men and women ($n=28$ and 50 , respectively). No significant sex differences were detected in CRP levels (males= 1.1 , females= 1.6 mg/L). A log-transformed CRP variable was used in all analyses. CRP was significantly positively correlated for both women and men with several body composition measures, including waist-to-stature ratio, included as a confounder in multivariate analyses (WSR; $p<0.001$). CRP was not significantly associated for women or men with perceived discrimination or SES. Greater family support showed a trend toward predicting reduced CRP among women only ($\beta=-0.25$; $p=0.06$; model $r^2=0.22$). Further, greater hours of reported daily TV viewing significantly predicted elevated CRP levels in both sexes (women: $\beta=0.30$; $p<0.05$; $r^2=0.38$; men: $\beta=0.33$; $p<0.05$; $r^2=0.25$). These findings build upon our previous research using several stress biomarkers (e.g., Epstein-Barr virus antibodies, blood pressure) and reinforce the importance of incorporating multiple biological measures in studies of psychosocial stress.

Supported by NIH (R01 DA017937; R01 DA01965); Oregon Social Learning Center; University of Oregon; Northwestern University.

54 Autoimmune Thyroid Disorders as a Consequence of Cold Adaptation among the Yakut of Siberia, TARA J. CEPON^{1*}, J. JOSH SNODGRASS¹, WILLIAM R. LEONARD², LARISSA A. TARSKAIA^{3,4}, T.M. KLIMOVA⁵, and V.G. KRIVOSHAPKIN⁵ (¹Department of Anthropology, University of Oregon, Eugene, OR; ²Department of Anthropology, Northwestern University, Evanston, IL; ³Department of Anthropology, University of Kansas, Lawrence, KS; ⁴Institute for Molecular Genetics, Russian Academy of Medical Sciences, Moscow, Russia; ⁵FSRI Institute of Health, Republic of Sakha/Yakutia, Yakutsk, Russia; tcepon@uoregon.edu).

Alterations in thyroid function appear to play a central role in adaptation to arctic environments. Increased thyroid activity in indigenous circumpolar populations is associated with upregulated metabolism, including elevated basal metabolic rate (BMR); however, little is known about the possible health consequences of these climate-induced changes in thyroid function. One potential consequence may be increased rates of autoimmune thyroid disorders as indicated by elevated serum levels of anti-thyroid peroxidase antibodies (anti-TPO). Clinical studies have shown anti-TPO antibodies to be elevated in 7 to 9% of European populations, but minimal data exist for

circumpolar groups. The present study was conducted among the Yakut (Sakha) of northeastern Siberia with the following objectives: 1) to determine overall prevalence of elevated anti-TPO among Yakut men and women; and 2) to examine correlations between anti-TPO and BMR, triiodothyronin (T_3) and thyroxine (T_4). Anthropometric and health data were collected from 300 Yakut adults (≥ 18 years old, 150 women, 150 men). Results indicate that 22.7% of women and 5.8% of men had above normal (>30 IU/ml) anti-TPO; no significant age-related changes were detected in the sample. Among women, anti-TPO measurements showed significant positive correlations with T_3 and T_4 , but no significant correlation with BMR. Among men, Anti-TPO showed a significant positive correlation with BMR. These findings report greater than average anti-TPO measurements among women and suggest possible consequences of increased thyroid activity in circumpolar environments.

Support: NSF (ARC-0802390); FSRI Institute of Health; Northwestern University; University of Oregon.

55 Ecological Correlates of Dental Eruption in Haplorhines, EMILY H. GUTHRIE^{1*}, KATERINA HARVAT^{2,3}, and STEPHEN R. FROST¹ (¹Department of Anthropology, University of Oregon, Eugene, OR 97403-1218; ²Department of Early Prehistory and Quaternary Ecology, Eberhard Karls University of Tübingen, Germany; ³Senckenberg Center for Human Evolution and Paleoecology, Eberhard Karls University of Tübingen, Germany; ehender1@uoregon.edu).

Primate dental eruption patterns, the order in which permanent teeth erupt into the mouth, are thought to reflect life history pace such that animals with shorter growth periods and faster growth rates erupt molars *earlier* than animals with longer growth periods and slower growth rates.

As more taxa are studied, however, this simple relationship is complicated. When Godfrey and coworkers analyzed dental eruption in a wide range of primate taxa—with a focus on Malagasy lemurs—they determined that variation in eruption pace was not clearly linked with ‘fast’ or ‘slow’ life history. Rather, ecological variables such as a folivorous diet may best explain developmental variation. While these results are suggestive, we have found exceptions to the idea that folivorous taxa are those with the earliest eruption of molars (i.e. colobines). However, Godfrey et al. (2001) specifically found that folivorous taxa have more advanced dental development at weaning and suggested that perhaps dietary hypotheses based on the ability to feed independently at weaning and/or to process those foods available to weanlings may be the actual target of selection.

To date, previous studies on the ecological correlates of eruption patterns have focused primarily on lemurs (strepsirrhines). Here, we evaluate haplorhine dental eruption data in light of these dietary hypotheses. Using newly determined dental eruption patterns, known ages at weaning and the postcanine dentition at weaning we find that numerous taxa do indeed conform to these hypotheses, including primates with highly unusual dental eruption sequences like *Tarsius*.

56 Sexual Selection for Sex Differences in Bonobo Locomotor Strategies: Implications for Interpretations of Ardipithecus, INDIA R. MINTON* and FRANCES J. WHITE (Department of Anthropology, University of Oregon, Eugene, OR 97403-1218; iminton@uoregon.edu).

Hominids are identified by an adaptive suite that includes anatomical adaptations for bipedalism, dental reduction, and relatively large brains. The first adaptation evident in early hominids is terrestrial bipedalism. Bipedality has traditionally been assumed to be an ecological adaptation for efficient travel across the expanding African savannahs of the late Miocene. Recently discovered hominid fossils, like *Ardipithecus ramidus*, provide evidence that bipedalism first arose in hominids that occupied forested habitats, forcing a critical re-evaluation of the Savannah Hypothesis. Alternatively, Lovejoy (2009) posits that sexual selection through female preference for less aggressive provisioning males would have been significant enough to adapt early hominids to a bipedal locomotor strategy. We present an alternative model for the evolution of bipedalism in forested environments that selected for rapid terrestrial travel. Sex differences in bonobo locomotion may reflect differences in factors that limit male and female reproductive success. Locomotor data were collected during focal animal follows for mode of travel to feeding and mating contexts for individuals in two communities of Lomako Forest bonobos, *Pan paniscus*. Most matings happened in fruit trees, and travel to mating data was focused on travel to and arrival in fruit trees ($G=124.707$, $P<0.001$). Adult males often arrived at mating localities quickly and on the ground ($G=26.587$, $P<0.001$). Adult females, in contrast, arrived using slower, arboreal travel. Adult male and female locomotion may reflect sex differences in the motivation for travel that is important in considerations of the evolution of locomotor morphology in primates and hominids.

57 Locomotor Anatomy and Behavior of Captive *Pan paniscus*, D.R. BOLTER^{1*} and A.L. ZIHLMAN² (¹Modesto College, Modesto, CA 95350; ²University of California, Santa Cruz, CA 95064; bolterd@mjc.edu).

Infants and juveniles are two stages of life history with different challenges and behaviors. Very little is known about their locomotor behavior and underlying anatomy. We present anatomical data on female *Pan paniscus* on these life stages. Through lab dissections on known individuals we quantify limb proportions to total body mass, total body muscle and bone and their distribution to the limb segments. Our results show that infants under a year of age have 22.0% muscle and 82.7% to their limbs; limbs are 27.7% of total body mass, with significant mass to the distal segments, the hands and feet. In juveniles, muscle increases to 43.5% and 83.8% goes to the limbs. However, in contrast to infants, muscle is distributed most to the proximal segments (arm and thigh) with decrease to hands and feet. Observations on locomotor behavior in a captive *Pan paniscus* group showed that juveniles were the most active in climbing and the only ones to leap across vertical supports.

These behaviors are consistent with field observations on *Pan troglodytes* where juveniles most often of all age classes climb and jump, activities emphasizing different muscle groups than in infants or adults.

58 Hylobatid Locomotor Anatomy and Evolutionary History, A.L. ZIHLMAN^{1*}, C. UNDERWOOD¹, and A. MOOT-NICK² (¹University of California, Santa Cruz, CA 95064; ²Gibbon Conservation Center, Santa Clarita, CA 91380; azihlman@ucsc.edu).

Gibbons and siamangs, the least studied of the apes, are now recognized as four genera based on distinct chromosome numbers: *Hoolock* (38), *Hylobates* (44, the lar group), *Symphalangus* (50, siamang), and *Nomascus* (52, crested gibbon). Traditionally morphological features such as cranial-facial dimensions, dentition, skeletal proportions, and pelage coloration served to classify species and to establish phylogeny. Few studies have focused on body composition and locomotor anatomy. This study reports new information on body mass and proportions based on whole body dissections of 12 individuals representing the four genera. Our findings demonstrate that each genus is characterized by distinct forelimb and hind limb proportions. For example, siamang forelimbs average 21% of total body mass and do not overlap with the other three genera. The hindlimbs are heaviest in *Hylobates* (20.3%), and siamangs and hoolocks, the lightest (17 and 16% respectively). These anatomical data on the limbs combined with new genetic and biogeographical data provide a more detailed picture of hylobatid evolutionary history and adaptation and point to locomotor anatomical differences that can be investigated in their natural environments.

59 The Importance of Bonobos to Evolutionary Models of Human Social Behavior: Ecological Correlates of Female Bonding, No Infanticide, and or Lethal Raiding, FRANCES J. WHITE*, MICHEL T. WALLER, INDIA R. MINTON, ROSS L. TINDALE, and KLAREE J. BOOSE (Department of Anthropology, University of Oregon, Eugene, OR 97403-1218; fwhite@uoregon.edu).

Studies of wild apes are fundamental to our understanding of human evolution. Until recently, scientists have focused on the violent nature of male chimpanzees to reconstruct early human societies. Humans have an equally close relative in the bonobo or pygmy chimpanzee. Bonobo societies are based on peaceful cooperation and strong social bonds both between males and females and among females. Bonobos show affiliation among unrelated females and long-term bonding between individual males and females. Bonobo communities have complex interactions carrying from avoidance to peaceful associations. Male bonobos do not form the bands associated with male cooperative killing behavior of chimpanzees. Instead, bonobo aggression is mild. The high level of female cohesion instead selects for individual male strategies instead of cooperative aggressive strategies and lethal raiding. Individual males target infants for affiliative social interaction as part of a complex strategy to gain

access to individual females and influence female choice and not for infanticide. Compared to chimpanzee habitat, bonobo habitat is more productive containing dispersed, non-monopolizable, scramble competition food (terrestrial herbaceous vegetation THV) and contestable food sources (fruit patches). THV does not select for cohesion as individuals disperse when feeding on THV. Female bonobo benefit from social bonding through shared defense of monopolizable food sources and cooperative shared knowledge of the dispersion of food patches. Ecological differences in the availability and use of clumped and dispersed food sources select for major differences in social behavior between bonobos and chimpanzees. During their evolution history, hominins occupied a wide diversity of habitats, and could therefore have included a wide range of social systems from highly female-bonded, non-aggressive systems to male-bonded, aggression-based social groups.

60 *Evolution of the Theropithecus oswaldi Lineage Through 3 Myr of Global Climatic Change*, **STEPHEN R. FROST**^{1*}, **EMILY H. GUTHRIE**¹, and **ERIC DELSON**^{2,3} (¹Department of Anthropology, University of Oregon, Eugene, OR; ²Department of Vertebrate Paleontology, American Museum of Natural History, New York, NY; ³Department of Anthropology, Lehman College, CUNY, Bronx, NY; sfrost@uoregon.edu).

Theropithecus oswaldi (Andrews, 1916) is the best known fossil primate species from the Neogene of Africa, represented by a significant fossil record from North, East, and South Africa spanning the time period from over 3.5 to approximately 0.25 Ma. Over this time period significant changes in the global climate and regional African habitats have occurred. During this time span, *T. oswaldi*, generally recognized as a terrestrial grazer, shows several clear morphological trends. These include a general increase in body size, molar tooth size and enamel complexity, reduction of the anterior dentition and shortening of the rostrum, enlargement of cranial superstructures associated with mastication, as well as increasing postcranial adaptations for terrestrial quadrupedal locomotion. In fact, evolution of these morphological trends through time has formed the basis for recognizing the chrono-subspecies of *T. oswaldi*: *T. o. darti*, *T. o. oswaldi*, and *T. o. leakeyi*.

While these trends show generally track the overall increase in aridity through time that occurs throughout the Pliocene and Pleistocene in Africa, they do not track specific major shifts in global climate, such as the major global cooling event associated with the onset of major continental glaciation in the northern hemisphere ca. 2.8 Ma, nor the shift in predominant orbital cycle. Instead, these trends seem to reflect increasing levels of adaptation to terrestrial grazing in *T. oswaldi* over time.

61 *The Effects of Economic Development and Lifestyle Change on Cardiovascular Health among an Indigenous Circumpolar Population*, **J. JOSH SNODGRASS**¹, **WILLIAM R. LEONARD**², **LARISSA A. TARSKAIA**³, **TARA J. CEPON**^{1*}, **T.M. KLIMOVA**⁴ and **V.G. KRIVOSHAPKIN**⁴ (¹Department of

Anthropology, University of Oregon, Eugene, OR; ²Department of Anthropology, Northwestern University, Evanston, IL; ³Department of Anthropology, University of Kansas, Lawrence, KS, and Institute for Molecular Genetics, Russian Academy of Medical Sciences, Moscow, Russia; ⁴FSRI Institute of Health, Republic of Sakha/Yakutia, Yakutsk, Russia; tcepon@uoregon.edu).

Lifestyle changes that occur with the transition away from traditional subsistence-oriented economies have been linked to obesity and cardiovascular disease, including among circumpolar groups in North America. However, our understanding of the health effects of economic development among indigenous Siberians is complicated by the social transformations brought about by Soviet collectivization and the collapse of the Soviet Union. Previous research documents a pattern of cardiovascular risk among native Siberians that contrasts with that seen in other populations undergoing market integration (i.e., extremely high blood pressure levels but relatively favorable blood lipid profiles), yet numerous questions remain about the specific lifestyle (e.g., activity and diet) and genetic factors that structure this distinctive health profile.

In the present study, we investigate lifestyle determinants of cardiovascular risk among the Yakut (Sakha), an indigenous circumpolar group from northeastern Siberia that is currently experiencing rapid lifestyle change. We collected anthropometric, health (fasting glucose, lipids, blood pressure), dietary, and sociodemographic/lifestyle data among 300 Yakut adults (≥ 18 years; 150 females, 150 males) from Berdygestiakh, Russia, which we compare with other circumpolar groups. Results demonstrate high rates of hypertension (males: 34%, females: 30%), and moderate levels of obesity (males: 13%, females: 21%), impaired fasting glucose/diabetes (males: 14%, females: 13%), and dyslipidemia (e.g., low HDL cholesterol [males: 22%, females: 7%]). Cardiovascular health in this community is rapidly deteriorating, which appears to reflect declining fitness and the growing consumption of market foods.

This study was supported by NSF (ARC-0802390), FSRI Institute of Health, Northwestern University, and the University of Oregon.

Ecotoxicology and Environmental Protection **Tuesday, 1:30 p.m. in Science 275**

62 *Ecotoxicology and Endangered Species*, **SCOTT HECHT** (National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources, Endangered Species Division, 510 Desmond Dr. SE, Lacey, WA 98503; scott.hecht@noaa.gov).

Threatened and endangered species typically face a suite of threats that left unchecked may injure or kill them and degrade or destroy their habitats. Contamination of species' habitats by toxicants is one such threat. An array of physiological processes that support an individual's growth, survival, and reproduction

are potential targets for toxic contaminants. Additionally, effects to a species' prey can reduce an individual's fitness by affecting the quality and availability of food. In recent studies with endangered West Coast salmonids, sublethal exposures to contaminants affected behaviors involved in feeding, swimming, and avoiding predators. Salmonids employ these behaviors to successfully navigate a complex lifecycle that take them from small streams to oceans and back again. Unfortunately, studies that evaluate physiological and behavioral effects are rare and typically not part of the standard battery of tests used to evaluate a contaminant's toxicity. The Endangered Species Act of 1973 established a process to evaluate such risks to listed species with the overall intent of avoiding jeopardizing a listed species from proposed federal actions. In practice an endangered species consultation integrates species biology and ecology with the available ecotoxicological data to determine risks from contaminants. Examples of toxicant effects to endangered species will be discussed as a mechanism to communicate ecotoxicological information.

63 *A Mechanistic Approach to the Evaluation of Pesticide Risks to Aquatic Species Native to the Pacific Northwest*, **JEFFREY J. JENKINS** (Department of Environmental and Molecular Toxicology, Oregon State University, Corvallis, OR 97331; jeffrey.jenkins@oregonstate.edu).

Approximately 13 million pounds of pesticides are used annually in Oregon – what are the risks to aquatic life and who decides? Pesticide use is regulated under a number of federal statutes, to include the Federal Insecticide Fungicide and Rodenticide Act, The Clean Water Act, and the Endangered Species Act. Regulations promulgated under the authority of these laws are often implemented by multiple federal agencies, and through federal/state partnerships. In addition, a variety of federal, state, and local entities, NGOs and university researchers, are engaged in activities designed to characterize and manage pesticide risks to aquatic ecosystems. The science that underpins pesticide regulatory decisions, and the evaluation of aquatic resource impacts, is increasingly controversial and considered inadequate by many. A mechanistic approach to the evaluation of pesticide risks to aquatic species native to the Pacific Northwest will be discussed.

64 *Landscape Risk Assessment as a Science-Policy Integrative Tool for Environmental Management*, **W.G. LANDIS***, **K.K. AYRE** and **A.J. MARKIEWICZ** (Institute of Environmental Toxicology, Huxley College of the Environment, Western Washington University, 516 High St., ES518, MS9180, Bellingham, WA 98225-9180).

One of the primary difficulties in managing contaminants in large-scale environmental systems is an overall quantitative and mechanistic framework in which to connect the services of the ecological structure with culturally driven mandates. These mandates can encompass human health, economic resources, religious values, and subsistence nutrition. Regional risk assessment using the basic structure of the relative risk model is a tool that

can integrate each of these mandates and to educate decision/policy makers. First, having a quantitative mechanistic framework can structure stakeholder discussions about management goals around ecological reality. Desires such as return the system to a healthy status, can be redirected towards delineated specifications. In some cases stakeholder derived goals may in fact be outside the reality of the system and a discussion about alternative goals can be initiated. Second, a regional approach includes the appropriate scales for decision-making and can reveal unintended consequences or unforeseen stressors. Third, the calculations of risk and especially of the uncertainty can formulate research that will specifically address the factors necessary to improve the assessment and the management process. A recent addition to regional risk assessment and specifically the relative risk method is the use of Bayesian networks (BNs) to calculate risk, explicitly express uncertainty and to calculate the outcomes of “what if ” management scenarios. Examples are used from sites as diverse as the INLAS forest research in eastern Oregon, the Puget Sound, and the South River in Virginia.

65 *Barriers to Sound Science-based Environmental Policy: Public Misconceptions Regarding Ecological and Physiological Processes*, **CHRISTINE OSWALD** (Department of Biology, Southern Oregon University, Ashland, OR 97520; oswald@sou.edu).

Policy makers and the public are reluctant to alter environmentally harmful practices, despite overwhelming evidence regarding the negative impacts of many human activities on the natural environment. A lack of understanding of important ecological and physiological processes contributes to this reluctance. The fundamental concept of ecotoxicology – toxins exerting effects on living systems – is readily understood and familiar. I will present examples of misconceptions that impede understanding of environmental problems and attempt to identify the underlying concepts of ecology and physiology that are crucial to correcting these misconceptions. I will explore ways in which ecotoxicology can serve as an educational tool to communicate these concepts in a readily understood fashion. Participants will discuss possible ways to convey their message to the public and policy makers.

**Forensic Science:
A Balance of Art and Science
Wednesday, 8:30 a.m. in Science 275**

66 *Ivory Identification at the National Fish and Wildlife Forensics Laboratory*, **MARGARET E. “COOKIE” SIMS** (National Fish and Wildlife Forensics Laboratory, 1490 East Main Street, Ashland, OR 97520; cookie_sims@fws.gov).

The National Fish and Wildlife Forensics Laboratory (NFWFL) often receives carved ivory objects as evidence. Because ivory-bearing animals are protected differently by various wildlife laws, evidence items must be identified to the

species level, when possible, for effective prosecution. Carved objects often lack diagnostic characteristics of the original element, thus morphological research attempts to discover new distinctive features that will aid investigators. There are several literature sources (e.g., Espinoza and Mann, 1992) that distinguish different types and sources of carved ivory. International trade continues to thrive, and new types and condition of ivory evidence drive research in new directions.

Espinoza, E. O. and M. J. Mann. (ed.) 1992. *Identification Guide for Ivory and Ivory Substitutes*. 2nd edition. Baltimore: WWF Publications.

67 Amazonian Feather Art in the Forensic Context, PEPPER W. TRAIL (National Fish and Wildlife Forensics Laboratory, 1490 East Main Street, Ashland, OR 97520; pepper_trail@fws.gov).

The indigenous peoples of Amazonia create some of the world's most beautiful and culturally significant artifacts constructed from feathers. There is no evidence that this activity, as traditionally practiced, threatened the survival of any Amazonian bird species, since the objects were produced in a specific cultural context and were not typically the object of trade. However, in recent decades, Amazonian feather artifacts have come to the attention of international collectors, and command high prices. These objects are now produced for sale, creating the potential for serious impacts on rainforest bird populations. To understand the conservation implications of this trade, it is necessary to document what bird species are used. This presentation will summarize analysis of 504 Amazonian feather art objects performed at the National Fish and Wildlife Forensics Laboratory.

Almost all items (92%) contained the feathers of species protected by United States laws and/or the Convention on International Trade in Endangered Species (CITES). The feathers of a minimum of 46 bird species were identified, including species of great conservation concern, such as Harpy Eagle and Hyacinth Macaw. By far the most commonly used feathers were those of the strictly protected Scarlet Macaw, found in 69% of objects examined. This analysis confirms that virtually all Amazonian feather artifacts include threatened bird species, and suggests that this illegal trade could jeopardize vulnerable wild populations.

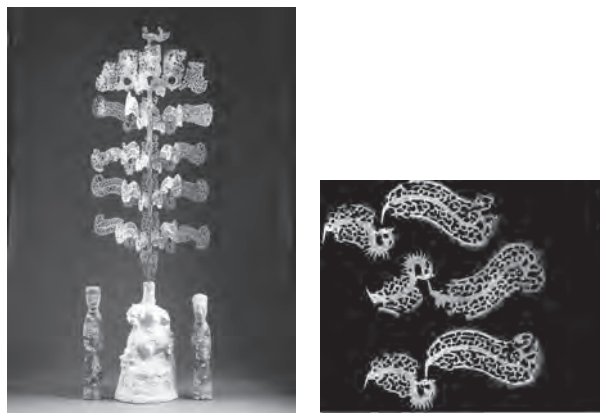
68 Use of X-ray Microanalysis and Infrared Microspectroscopy for Multianalytical Characterization of the Walters Codex, an Ethiopian Manuscript, NATASJA A. SWARTZ and TAMI LASSETER CLARE (Department of Chemistry, Portland State University, 1719 SW 10th Avenue, Portland, OR 97201; claret@pdx.edu).

Since the 6th century AD, holy scribes in the Ethiopian Orthodox Church have recorded sections of the Bible onto goat-skin parchment using red and black ink to produce manuscripts of the Psalter. Many of these manuscripts have been exported for auction as a result of the political and economic instability in Ethiopia over the last two centuries and prior to auction pages have been “illuminated” with overpaintings of biblical scenes, presumably to increase their value. The use of microanalytical techniques of objects of cultural heritage allows an in-depth look

into the materials' elemental composition of artifacts, which can be used to help establish whether materials are original to the object or were added at a later date. Scanning electron microscopy with Energy dispersive x-ray analysis (SEM-EDX) and X-ray fluorescence spectrometry (XRF) were used for elemental analysis of the inks and paints found in the Walters Codex, a 17th century Ethiopian Manuscript. Organic components of samples of the ink and paint were characterized by FT-Infrared microspectroscopy. Based on the materials analysis it seems likely that the overpaintings were added in the first half of the twentieth century. The findings from this project may be used to authenticate and to date other manuscripts.

69 Uncovering Mysteries of a Chinese Burial Relic, TAMI LASSETER CLARE (Department of Chemistry, Portland State University, PO Box 751, Portland, OR 97207-0751; claret@pdx.edu).

In the Han Dynasty elaborate bronze Money Trees were entombed with the deceased to provide prosperity in the after-life. In the collection of the Portland Art Museum is a curious example of one of these Trees: it shows heavy soil encrustations and plant roots that have grown onto the branches. And, some of its branches appear to have been replaced while other broken branches may have been repaired. This study demonstrates how scientific analysis (XRF, FTIR and X-radiography) of the Tree can be used help establish whether all or part of the Tree could date to the Han dynasty.



Portland Art Museum, Yao qian shu (Money Tree), 2004.114.9A-C
Height: 52 in; Width: 22 in; Depth: 19.5 in.
The Arlene and Harold Schnitzer Collection of Chinese Art
Left image: photograph of the Money Tree.
Right Image: X-radiograph of branches.

70 The Art of Raman and Raman of Art: A Powerful Technique to Direct Art Restoration and the Identification of the Real and Fake, ANDREW WHITLEY (HORIBA Scientific, 3880 Park Avenue Edison, NJ 08820; andrew.whitley@horiba.com).

Raman spectroscopy has in the last twenty years grown at a rate unprecedented in previous decades. In fact Raman

spectroscopy has probably grown faster than any other analytical spectroscopic technique in this time. For those lucky enough to be involved with this powerful instrumentation during this time this is perhaps not so surprising. Compared to other spectroscopic techniques Raman spectroscopy provides many advantages for providing fundamental information about a sample. The theory of Raman spectroscopy is relatively simple. Visible light, typically provided by a laser, is used to excite and measure the vibrational frequencies of bonds in the molecules that make up a material. As Raman is a scattering technique it does not suffer from many of the difficulties that face its sister technique - infrared spectroscopy. In the early to mid 1990s the introduction of new technology advances like holographic notch filters and CCD detectors catapulted dispersive Raman spectroscopy forward on the back of the interest in the technique initiated with the introduction of FT-Raman. Recent advances have opened up even more exciting possibilities like rapid Raman imaging. This review will concentrate on the study of art which is just one application area of the many possible with Raman spectroscopy. We will show how Raman spectroscopy is used to help art restoration, identify fakes and help understand the source and history of materials used by artists many centuries ago.

Wildlife Forensics

Wednesday, 1:30 p.m. in Science 275

71 *Numbering the Dead: Techniques for Determining the Minimum Number of Individuals Represented by Feathers and Other Bird Remains*, **PEPPER W. TRAIL** (National Fish and Wildlife Forensics Laboratory, 1490 East Main Street, Ashland, OR 97520; pepper_trail@fws.gov).

A problem frequently faced by wildlife forensic scientists is determining the minimum number of individuals (MNI) in an assemblage of remains. This information is important for calculating the number of violations in a case, in order to assess the appropriate penalties. MNI determination is straightforward if intact carcasses or major body parts are present. However, it can be challenging if the remains are highly decomposed, or have been divided into parts, such as feathers.

Flight feathers, particularly the primaries (outer wing feathers) and tail feathers, have attributes that make them suitable for MNI determination. The number of such feathers per individual is usually consistent within major groups of birds. For example, hawks and eagles have 12 tail feathers, and 10 primaries on each wing. These feathers can often be assigned to their exact location on the bird based on shape. Counting the replicated individually-identifiable elements yields the MNI. For example, if three outermost left primaries are identified in an assemblage of Golden Eagle feathers, this indicates that at least three individuals are represented.

A training video on determining minimum number of individuals from bird remains is available from the Forensics Lab, and a segment will be presented, demonstrating the steps in

determining MNI from a collection of feathers.

72 *Forensic Identification of Black Coral*, **EDGARD ESPINOZA, MIKE SCANLAN, PAMELA McCLURE***, and **BARRY BAKER** (USFWS National Fish and Wildlife Forensics Laboratory, 1490 East Main Street, Ashland, OR 97520; pam_mcclure@fws.gov).

Black corals (Antipatharia) are a group of generally deep water, tree-like corals that normally occur in the tropics. There are about 42 genera and 230 described species of Antipatharians. Black coral is listed in Appendix II of the Convention on International Trade in Endangered Species (CITES). Black corals are routinely used to construct jewelry items (i.e., rings, earrings, necklaces, etc.), but the importation of these items is regulated by CITES permits. The Fish and Wildlife Service, Office of Law Enforcement, has about 200 Wildlife Inspectors around the nation who seize items that are either lacking the CITES permits or are suspected of being smuggled black coral jewelry.

The National Forensic Laboratory conducts several analyses to determine the materials source of black jewelry. Fourier Transform Infrared analysis elucidates the protein nature of black coral, while X-ray fluorescence confirms that the appropriate inorganic elements are present. Lastly, macroscopic and microscopic morphological analyses reveal diagnostic characteristics which are specific to the Antipatharia. This battery of tools only provides identification to the order Antipatharia. Species specific identification relies on specific morphological characters observed in the intact coral, and a priori knowledge of its geographical source.

73 *Forensic Identification of Bald and Golden Eagles using Nuclear DNA Markers*, **MARY K. BURNHAM-CURTIS** (National Fish and Wildlife Forensics Laboratory, U.S. Fish and Wildlife Service, 1490 East Main Street, Ashland, OR, 97520; mary_curtis@fws.gov).

Eagles are large raptors of the Family Accipitridae, numbering more than sixty species across the globe, with only two, the Bald eagle (*Haliaeetus leucocephalus*) and Golden eagle (*Aquila chrysaetos*) found in the US and Canada. Eagles were afforded Federal protection due to severe population declines from over-hunting in the mid-1900s. These declines were exacerbated by reproductive failures from adverse effects of pesticides and environmental contaminants. Eagle feathers are powerful symbols in Native cultures, and may be obtained legally for religious practices only by special permit. Despite Federal protection, Bald and Golden eagles are still subject to illegal take that fuels a significant illicit market in eagle feathers. Intact flight feathers can be identified morphologically, but to determine species origin of shed feathers, or to estimate minimum number of individuals represented by a collection of loose feathers is difficult. Polymorphic nuclear loci identified from published studies were tested on eagle feathers and carcasses submitted to the USFWS National Fish and Wildlife Forensic Laboratory for species identification and individual matching. Thirteen loci were targeted

for use in forensic identification of Bald and Golden eagles. Four loci tested showed species-specific alleles or frequency distributions, and nine were sufficiently polymorphic to allow inference of individual identity or minimum number of individuals. Alleles per locus ranged from 1 to 11, and levels of heterozygosity ranged from 0 to 0.218 in Bald eagle and 0 to 0.406 in Golden eagle. Low levels of heterozygosity are presumably a consequence of reproductive bottlenecks after severe population declines.

74 Utility of Short Tandem Repeat (STR) Markers for Forensic Application in Gemsbok (*Oryx gazella*), BRIAN C. HAMLIN*, STEVEN R. FAIN, JOE ZOLINE-BLACK and JAKE C. MINER (USFWS NFWFL, Ashland, OR, 97520; brian_hamlin@fws.gov).

This study describes the development of nuclear DNA short tandem repeat markers for the forensic identification of gemsbok. Gemsbok are a large antelope species native to the Kalahari region of southern Africa where they currently number around 275,000. From 1969-1977 approximately 93 oryx were released onto the White Sands Missile Range of southern New Mexico from an original founding stock of fewer than 20 individuals. In 40 years Gemsbok have reproduced to a current population of 2,500-3,000 animals.

Fifty-four sets of STR primers derived from domestic cow and sheep were screened against 10 gemsbok. Twenty-nine primer sets amplified discrete products under conditions used on domestic cow and were considered candidates for further testing. With the optimization of amplification conditions for gemsbok, 20 of the 29 candidate loci were found to be polymorphic with a mean of 2.5 alleles/locus and a range of 2-6 alleles/locus. Twelve primer sets were selected and combined in three different multiplex panels and used to characterize genetic variation in a population sample of 100 gemsbok.

The introduction of gemsbok into New Mexico followed similar practices as the recovery programs for endangered species such as Mexican gray wolf (*Canis lupus baileyi*), red wolf (*C. rufus*) and Florida panther (*Puma concolor coryi*). Moreover, populations of game species such as North American elk (*Cervus elaphus*), black bear (*Ursus americanus*) and white-tailed deer (*Odocoileus virginianus*) have been similarly established. The genetic characterization of gemsbok in New Mexico adds to our understanding of how such experimental populations capture and maintain genetic variability. It also underscores the need for forensic individualization statistics to account for population demography and history.

75 Species Identification of Ivory Source, ROBERT M. HOESCH and STEVEN R. FAIN (U.S. Fish and Wildlife Forensics Laboratory, Ashland, OR 97520; bob_hoesch@fws.gov).

The illegal killing of elephants for their ivory is a serious conservation issue. Although CITES regulations initially reduced levels of poaching, the situation has worsened as the

value of illegal ivory has increased. Some current estimates indicate that 8-10% of the African elephant numbers are being killed each year to satisfy the world wide demand for ivory and ivory products.

Ivory can be obtained from the teeth of other animals (for example, walrus, hippopotamus or whale), but the large majority of commercially obtainable ivory has been from elephant. Morphological criteria can, in some cases, be used to distinguish the ivory of elephants from that of other animals. If that morphological information is missing, species origin of ivory may still be determined by analysis of the small amount of degraded DNA remaining in the ivory. Even if morphological information is available to confirm an elephant origin, the information is not sufficient to determine if the source is the African or the Asian species. Genetic analysis provides the method by which final species determination is made.

The NFWFL has been accepting and analyzing submissions of ivory (or suspected ivory) items for over a decade, and the capabilities for identifying ivory origin have evolved and continue to be developed. This presentation describes the collaboration between morphological and genetic approaches, and the methods used to identify species origin of ivory. The Genetics Section of the laboratory has analyzed more than seventy evidence items which have been confirmed as ivory, and the overall rate for conclusive identification has been approximately 85%. This presentation will discuss the methods used to carry out ivory identification, and the development of newer methods which may improve the identification process.

76 Mitochondrial and Y-Chromosome Data Reveal Evidence for Historical Introgression of *Canis lycaon* and *C. rufus* DNA into *C. latrans*, DYAN J. STRAUGHAN* and STEVEN R. FAIN (USFWS National Fish and Wildlife Forensic Laboratory, Ashland, OR, USA; dyan_straughan@fws.gov).

Since their listing under the Endangered Species Act (1974), gray wolves have demonstrated a remarkable recovery. However, taxonomic issues dealing with hybridization between *Canis lupus* and *C. latrans* have confounded legal protections. The discovery of coyote mitochondrial DNA (mtDNA) haplotypes by Lehman et al. (1991) in nearly 60% of Great Lakes wolves has led to a continuing debate as to whether these haplotypes are the result of ongoing hybridization between *C. lupus* and *C. latrans*, or whether they are in fact demonstration of a unique canid species, *C. lycaon*. Because wolves in the Great Lakes regions of the United States are still federally protected, it is critical that the issue of ongoing versus historical hybridization between wolves and coyotes be resolved.

Much of the discussion has focused on wolves, yet coyotes may also be informative in determining what historical hybridization frequencies may have been. This study characterized maternally and paternally inherited markers (mitochondrial control region sequence and Y chromosome microsatellites) in coyotes from areas where wolves and coyotes are sympatric (Wisconsin, Wyoming and Saskatchewan) and failed to reveal

any evidence of ongoing hybridization. The absence of shared mtDNA or Y-chromosome haplotypes between coyotes and sympatric wolves, suggests that both the coyote-like mtDNA and Y-chromosome haplotypes observed among gray wolves, and the wolf-like haplotypes observed in coyotes, originate from hybridization events that occurred approximately 55,000 years ago. Additionally, phylogenetic analysis of the data identified at least two distinct clades within coyote mtDNA, at least three clades in the Y chromosome data, as well as haplotypes that are similar to *C. lycaon* and *C. rufus*. These distinct clades may represent ancient wolf lineages that have evolved separately in coyotes, but have become lost in gray wolves as a result of the catastrophic extirpations ongoing in the US over the last 150 years.

Defended by Poets: The Role of Art in Communicating Change in our National Parks

Wednesday, 1:30 p.m. in Science 171

77 Harnessing the Communication Power of the National Parks to Address Climate Change, **LEIGH WELLING and ANGIE RICHMAN** (Climate Change Response Program, National Park Service, 1201 Oakridge Dr., Fort Collins, CO 80525; leigh_welling@nps.gov).

There is a great need at this time for powerful, consistent messages about climate change and its impacts. The emerging threat of climate change brings added emphasis to the role of protected areas for conserving biodiversity, promoting ecosystem adaptation, enhancing scientific knowledge about climate change impacts, and engaging communities in learning and stewardship activities. However, in a future in which more people will be vying for fewer resources, the relevance of protected areas must become more visible to the human communities that live in or depend on them. How can the National Park Service (NPS) reach a wider audience with this message? Known internationally for excellence in communicating about park resources and values to more than 300 million visitors every year, the NPS is uniquely positioned to raise awareness of the implications and likely impacts of climate change to our Nation’s resources. Park interpretive and educational programs already encourage a personal stewardship ethic for preserving our current quality of life as well as protecting park resources so that they may be enjoyed by present and future generations. Many efforts are also underway to communicate climate change science – as well as actions that can be taken to mitigate and adapt to change. An overview of current efforts will be presented; discussion and audience participation will be encouraged to explore other creative opportunities for engaging citizens of all ages in understanding and experiencing how climate change is affecting the planet’s resources and how they may adapt their behavior to promote resource stewardship.

78 From Cool Globes to Kid’s Songs – Can Art in the Parks

Make Climate Change Connections? **WILL ELDER^{1*}, LAURA CASTELLINI¹, CRISSY FIELD CENTER STAFF² and GEORGE SU¹** (¹Golden Gate National Recreation Area, Fort Mason, Bldg. 201, San Francisco, CA 94123; ²Golden Gate National Parks Conservancy, Crissy Field Center, 1199 East Beach, San Francisco, CA 94129; will_elder@nps.gov).

Golden Gate National Recreation Area is experimenting with various forms of art to communicate climate change issues and sustainable practices to the public. Four examples are presented and their efficacy discussed here. 1) The park hosted an art exhibit at Crissy Field called Cool Globes. This exhibit featured five-foot diameter globes embellished by artists to present environmental themes that brought awareness to climate change issues, and encouraged individuals, businesses and governments to adopt simple solutions to fight global warming. The exhibit was high profile in a heavily visited area. 2) In association with the exhibit, students at the San Francisco Academy of Art University were enlisted to conceptualize and create art for environmental posters. Five of these posters were selected and put on display at the opening of the Cool Globes exhibit and then exhibited on campus. 3) Environmental education programming at Crissy Field Center incorporates participatory art in a climate change educational program for 5th and 6th graders. In this program, students participate in a series of learning activities about climate change and sustainable practices, and then create their own musical compositions on climate change themes. 4) The park created an exhibit on sea level rise at Crissy Field that was initially conceptualized as an art exhibit, but shifted more to a scientific “instrument-like” exhibit during the scoping process. This example will be used to discuss how art might reduce the potential scientific impact of an exhibit and distance the audience from its potentially alarming content.

79 Crater Lake National Park: Translating the Wonder Through Art and Sound! **LINDA HILLIGOSS** (Crater Lake Science and Learning Center, Southern Oregon University, 1250 Siskiyou Blvd., Ashland, OR 97520-5038; hilligol@sou.edu).

A striking 72% of visitors say that one of the most important reasons for preserving national parks is to provide opportunities to experience natural peace and the sounds of nature. Working through its Science & Learning Center, Crater Lake National Park education programs encourage visitors to use all of their senses to appreciate and demystify the wonders of the park. Noise can impact the acoustical environment much like smog impacts the visual environment. The symphony of natural sounds within our national parks is an important natural resource and a critical component of the ecological communities that parks seek to preserve. The park’s Artist-in-Residence program invites artists skilled in diverse art forms to be inspired by the park and help others appreciate it through a new lens or with fresh ears. A recent visiting artist worked with park scientists and a local school group to capture unique features of the park’s acoustical environment including snow falling, the wind blowing, animal sounds, and the perceived “sounds of silence.”

Students then wrote poems and prose creatively describing the sounds they heard. The voices of the students reading their work were recorded over the park sounds and will be featured at an art show on the rim of Crater Lake this summer. The Science & Learning Center is operated in partnership with Crater Lake National Park's academic partners, Southern Oregon University and Oregon Institute of Technology.

80 *Visualizing Climate Change: A Survey*, **WILL GEORGE**^{1*} and **MICHEAL LIANG**² (¹Lewis and Clark National Historic Park, 92343 Fort Clatsop Road, Astoria, OR 97103; ²North Cascades National Park and North Coast and Cascades Science Learning Network, 810 State Route 20, Sedro-Woolley, WA 98225; will_george@nps.gov).

For many, climate change is an issue of such enormity that it becomes incomprehensible. One cannot easily empathize with numbers, charts, and data. Just what does 1 ton of CO₂ look like? Where does it come from, where does it go, and why is it bad? The arts--with its abilities to visualize, to evoke emotion, and to form new intellectual connections--should be used as communication tools to answer such questions. Through the lens of the artist, the broad topic of climate change becomes filtered into something personal and relatable. In this presentation, we'll highlight creative projects that illustrate climate change in ways that are both innovative and memorable.

81 *Painting the Lifespan of a Forest*, **JIM A. LUTZ** (College of the Environment, University of Washington, Box 352100 Seattle, WA 98195-2100; jlutz@uw.edu).

Trees spring forth, grow tall, and die on a timespan so long and slow it is difficult for humans to recognize and comprehend the life of a forest. Tracking the ecological consequences of climate change and other environmental stressors upon forest systems is thus more difficult. What determines where trees grow? How do trees of different species interact with each other? Do the varying sizes of individual trees affect the structure and function of the overall community? How do dead trees continue to influence the forest? A simple yet ambitious project in Yosemite National Park is cataloging and mapping every tree in a 26 hectare plot, from saplings 1 cm in diameter to sugar pines 2 m in diameter and hundreds of years old. Designed to continue for centuries, this monitoring project involves countless students and citizens, allows testing of ecological theories, and help us understand how a sensitive forest may respond to changing conditions. It has also produced a tantalizing image in the form of a map of every tree trunk. The pattern is fractal-like, with strings and arcs, clusters and voids. It is reminiscent of the pattern of galaxies in the universe, bubbles on the sea, or an abstract painting. This intriguing image, with its hidden complexities, will change over time, a canvas that will hopefully never be finished.

CONTRIBUTED ORAL PRESENTATIONS

Anthropology and Archaeology Section Monday in Science 215 at 8:45 a.m.

82 *Orientalism, Invention, and the New Exotic: A Study of American Belly Dance*, **JENNIFER HAYNES-CLARK** (Independent Scholar, 1005 Crimson Ct. Talent, OR 97540; jhaynesc123@charter.net).

Belly dance classes have become increasingly popular in recent decades in the Western United States. Many of the predominantly white, middle-class American women who belly dance proclaim it is a source of feminist identity and empowerment that brings deeper meaning to their lives. American practitioners of this art form commonly explain it originated from ritual-based dances of ancient Middle Eastern cultures and regard their participation as a link in a continuous lineage of female dancers. In contrast to the stigmatization and marginalization of public dance performers in the Middle East and North Africa today, the favorable meaning American dancers attribute to belly dance may be indicative of an imagined history of this dance.

Based on ethnographic fieldwork conducted on the West Coast of the United States and Morocco in 2008-2009, I explore the unique significance that American dancers glean from this dance form. I argue that an investigation of American belly dance reveals that its imagery and concepts draw from a larger discourse of Orientalism, connected to a colonial legacy that defines West against East; a process of othering that continues to inform global politics and perpetuates cultural imperialism. But the creative identity construction that American women explore through belly dance is a multi-layered and complex process. Rather than pretending to be the exotic Other, many of these women are inventing an exotic Self. This study contributes to a greater understanding of identity and society by demonstrating ways that American belly dancers act as agents, creatively and strategically utilizing discursive motifs to accomplish social and personal goals.

83 *Composition of Ancient Rope and Cloth from the Judean Desert*, **TERENCE M. MURPHY**^{1*} and **NAHUM BEN-YEHUDA**² (¹Department of Plant Biology, University of California, Davis, CA 95616; ²Department of Jewish History, Bar Ilan University, Ramat-Gan, 52900 Israel; tmmurphy@ucdavis.edu).

The "Christmas Cave", located in the Judean Desert on the west bank of the Dead Sea, was discovered by John Allegro in 1960. Among the archaeological finds from this cave are textiles from various periods. It is generally accepted, based on both literary sources and archaeological finds, that the primary fibers in use at that time (1st - 4th centuries CE) in the Land of Israel were lamb's wool, goat and camel hair, and flax-linen. This research project focuses on the genetic identification of

vegetable fiber ropes and fabrics found in the Christmas Cave. Optical microscopy and X-ray diffraction have indicated that the main fiber used in articles of this type is flax. However, it is difficult to discern between quite similar cellulosic fibers, such as flax and hemp, by these means, and all the more so when they are ancient, having suffered the deteriorating effects of time. Plant fibers extracted for rope and thread contain attached parenchymal cells, and the nuclei in these cells remain sufficiently intact to be used for genetic analysis. We have amplified segments of the chloroplast genes, *rbcL* and *trnL*, of ropes and fabrics from the Christmas Cave and used the gene sequences to identify the components. We confirm that the major DNA component is flax, but there are significant fractions of hemp in many, if not most, samples.

84 Sexual Dimorphism in Growth of Human Manual Digital Proportions, DEANNA M. MORRIS*, STEPHEN R. FROST, ROBERT PASTOR, J. JOSH SNODGRASS, LAWRENCE SUGIYAMA, and FRANCES J. WHITE (Department of Anthropology, University of Oregon, Eugene, OR 97403-1218; dmorris2@uoregon.edu).

Sexual dimorphism in manual digital proportions, specifically between the 2nd and 4th digit (2D:4D), is linked to many factors, including health, attractiveness, and reproductive parameters. The 2D:4D ratio, if shaped by exposure to sex hormones in utero as believed, should be observable at an early age. Alternatively, sexual dimorphism in 2D:4D may be a consequence of normal patterns of hand growth, and because males have a relatively longer period of growth. In order to evaluate these hypotheses about 2D:4D ratio, we measured lengths of all metacarpals and phalanges from 27 males and 27 females at two ages: 2-3 and 17-18. Data were collected from radiographs housed at the Oregon Health and Science University, School of Dentistry. Measurements were made by tracing hand bones onto acetate paper and then measured with digital calipers. The 2D:4D was calculated by summing all phalangeal lengths for the second digit and dividing it by those for the fourth. Additionally, principal components analysis was utilized to analyze hand shape differences.

Although quantitatively the females had higher digit ratios in both age classes, the digit ratio difference between males and females was not statistically significant. This may be due to small sample size constraints. However, the 2D:4D ratio did increase in both sexes with age, and principal components analysis of all 19 hand bone lengths reveals other aspects of hand shape besides 2D:4D ratios, including the relative length of metacarpals vs. phalanges differing strongly between males and females as well as between children and adults.

85 The Nguoi Rung Footprint: Evidence of Vietnam's "Forest People"? D. JEFFREY MELDRUM (Department of Biological Sciences, Idaho State University, 921 S. 8th Ave., Pocatello, ID 83209, meldd@isu.edu).

Southeast Asia has been a hotbed of recent zoological

discoveries. Over a thousand new species have been identified including some large mammals, e.g. the Vu Quang ox. Among regional anthropological discoveries, the Indonesian "Hobbit" (*Homo floresiensis*) has prompted reconsideration of the prospects of relic ape, or even hominin species in the area. Folklore and contemporary accounts of an upright walking ape, the Nguoi Rung, or "forest people" emanate from Vietnam, with similar descriptions elsewhere in Southeast Asia. The indigenous tribal people, the Degar, tell of a creature 1.8 m tall, walking upright, covered with grey to brown or black hair. Veterans of the Vietnam conflict have described encounters with what they termed "rock apes," so-named for their proclivity for pelting the G.I.s with stones. One artifact that has often been cited as evidence of the Nguoi Rung is a footprint, discovered and cast by Professor Tran Hong Viet (zoologist), of the Vietnam National University, Hanoi. The single print was found in 1982, on the slopes of Cho Mo Ray, in the central highlands, Kontum Province, during post-war inventory of natural resources. It depicts the impression of a plantigrade pentadactyl hind foot measuring 28x16 cm. Dr. Viet has suggested it may represent the presence of relic populations of *Homo erectus*, presumed to have become extinct possibly as recently as 27 kya. Photographs of the footprint were examined to evaluate the potential candidate trackmakers, including relic hominins, a mainland orangutan, or the Asiatic black bear and sun bear.

Health Sciences Section

Monday in Science 215 at 10:30 a.m.

86 Patent Foramen Ovale as a Cause of Migraine Headache in Adults with Congenital Heart Disease with No Known Cardiac Shunts, MARAT A. VOLMAN*, RUBINE GEVORGYAN, and JONATHAN M. TOBIS (Department of Medicine, Division of Cardiology, David Geffen School of Medicine at UCLA, 10833 Le Conte Ave., Factor Building B-976, Los Angeles, CA 90095; MVOL2005@GMAIL.COM).

Patients with congenital heart disease (CHD) have a higher frequency of migraines than controls. This is true not only for patients with diagnosed right-to-left and left-to-right shunts but also for patients with CHD not known to be associated with a shunt. Our hypothesis is that the higher migraine frequency in this population may be due to an unrecognized patent foramen ovale (PFO).

To examine the incidence of PFO in adults with CHD who do not have a primary diagnosis of a shunt, patients from the Ahmanson Adult Congenital Heart Disease Center at UCLA were contacted. Two trans-cranial Doppler (TCD) readings were performed – one at rest and one while the patient performed a Valsalva maneuver.

In our previous study with 800 adult CHD patients, the migraine frequency in patients with a history of right-to-left, left-to-right, and no diagnosed shunts was 52%, 44%, and 38%, respectively ($p < 0.001$). A control population had a frequency of

11%. In the current study, 32% of patients with CHD not known to be associated with a shunt tested positive for a PFO.

Despite previous echocardiograms, patients with CHD not known to be associated with a shunt often have a right-to-left shunt as demonstrated on a TCD. This is most likely mediated through a PFO that may not be diagnosed through traditional echocardiographic tests. Given the association between a right-to-left shunt and migraines, these results may explain why CHD patients with no formal diagnosis of a shunt have a high migraine frequency.

87 *H1N1: Then and Now*, **JESSICA BOWMAN** (Department of Biology, Southern Oregon University, 1250 Siskiyou Boulevard, Ashland, OR 97520; 70 Garfield St., Apt 9, Ashland, Oregon 97520; bowmanj@students.sou.edu).

The Novel Influenza A Virus is a virus that has been around for many years infecting millions of people. It was the cause of the 1918 Spanish Flu pandemic and responsible for the infected boy in Sheboygan, Wisconsin in 2005. H1N1 is a result of reassortment from the Avian Flu, Swine Flu, and the common Human flu. This matter became a national threat on April 26th, 2009, and officially became a global threat on June 11th, 2009 when Dr. Margaret Chan, Director-General of the World Health Organization, declared a Phase 6 worldwide pandemic.

It is astonishing how a minuscule microorganism can cause catastrophic events. It is vitally important to prepare for infection. Proper precautions should be met, and with the help of local officials and willing and able citizens, this virus can be managed; and hopefully, not live up to its expectations of exceeding the 50 million people slain by the 1918 Pandemic. “H1N1 is a serious virus capable of causing severe disease and death. Everyone has a role in preventing the spread of the flu” ([U.S. Department of Health and Human Services 2009 a](#)).

This presentation will lead you through the beginning of this outbreak that started in 2009 and its current statistics in 2010. An interactive view of the globe and with its respective outbreak sites will provide a modern and accurate view of the technology used for this research project.

88 *Surfing for Misinformation: Emerging Trends in Vaccine Opposition Website Content*, **SANDRA J. BEAN** (Department of Public Health, College of Health and Human Sciences, Waldo Hall 254, Oregon State University, Corvallis, OR 97333; beans@onid.orst.edu).

Today’s seekers of medical care are better educated and increasingly seek medical information and guidance from the Internet. Information on the Internet, however, is inherently mercurial (pun intended), with a half-life of about two years. Website home pages may migrate down to links, replaced by new home pages, and existing content may vanish overnight. This instability provides a “rapid response” indicator to trends or changes in the thinking of vaccine opposers. For example, some vaccine questioning websites added content within days of news of *The Lancet’s* withdrawal of the 1998 Wakefield study

linking the MMR vaccine with autism. Fifteen current vaccine opposing websites were examined for content and design attributes and the results compared to a content analysis by Wolfe et al. (2001). Two new themes emerged in the new analysis and one new design feature. The first of these is “manufactured threat” in response to the H1N1 influenza vaccination promotion of 2009–2010. The second is “government secrecy” where the government is believed to withhold information from the public. In addition, a new design feature of professional testimony decrying the ill effects of vaccination has largely replaced that of parental testimony. These three changes are likely harbingers of shifts in the vaccine opposition movement likely to be seen by health care providers and the public health community.

With thanks to her advisor, Joseph Catania, PhD., Professor, Oregon State University Dept of Public Health, and Dr. Dwaine Plaza, PhD., Associate Professor, OSU Dept of Sociology, for reviewing and commenting on her presentation.

Computer and Information Sciences Section Monday in Science 215 at 1:30 p.m.

89 *Software Security in the .Net Framework (Attack and Defense)*, **JON McCOY** (Department of Computer Science, Southern Oregon University, 1250 Siskiyou Boulevard, Ashland, OR 97520; Jonathan.McCoy@Hotmail.com).

Software has always been subject to attack regardless of how much protection is in place. This presentation will look at the security ramifications of using the Microsoft .NET program environment. The .NET environment being a managed environment negated some of the old methods of attack, it also opened new areas of vulnerability. This presentation will explore some common mechanisms for program protection and how to subvert them. This area of program security has become an arms race of innovative new attacks and new corresponding countermeasures. This presentation will focus on code protection, program integrity, and application subversion. The defenses evaluated primarily utilize third party solutions to protect compiled programs, while the attacks described in this presentation will utilize vulnerabilities inherent to the .NET Framework.

This area of research is not only critical for protecting intellectual property rights but necessary for general application security.

Psychology Section Monday in Science 215 at 1:50 p.m.

90 *The Imaginal Stone: Stories of Self and World*, **CYNDERA M. QUACKENBUSH** (Counseling Psychology, Pacifica Graduate Institute, 249 Lambert Road, Santa Barbara, CA 93013; cyndera@hotmail.com).

The realm of relationships not only includes intrapsychic and interpersonal relationships, but also the relationship between humans and the world. This participatory epistemological

master's thesis explores that relationship through stone, an accessible entity of Earth. A relationship with stone can be seen throughout various times and cultures; stones have played significant roles within mythology, shamanic practices, ancestral worship, and divination. Stone was a major preoccupation in the ancient art of alchemy, which Carl G. Jung later paralleled to the process of individuation. Psychological views and modern approaches to stone are explored in the writings of Jung, Stephen Aizenstat, Maud Oakes, and James Hillman. These writings reveal how meaningful relationships with the non-human objects of the world may foster a greater connection to, and thus greater care for, the environment.

The story of a particular kind of stone, what the author has named the Imaginal Stone, is revealed through its geological history and discovery by the author's father. Possessing a unique intensity of imagery that resulted from oxidized mineral deposits that migrated throughout the rock over a billion years ago, the Imaginal Stones offer an experience of Nature's art works. The stones contain abstract images and direct depictions of and beyond the human world. By following the impact these stones had on the author's father and others, possibilities of numinous, and therefore healing, encounters with the world are explored. The emerging relationship between the Imaginal Stones and the author is documented through the study of dreams, active imagination, and synchronicity.

**Social, Economic and
Political Sciences Section
Monday in Science 215 at 2:10 p.m.**

91 *Science: A Lever for Global Integrity*, **KALÁ PERKINS** (Department of Bioethics, Loyola Marymount University, 1 LMU Drive, Los Angeles, CA 90045; quasar9@mac.com).

Global community across multiple disciplines within the scientific community is not a far off utopian ideal but a teeming dynamic reality. With the level of integrity and transnational communication being demanded to meet the standards of participation, and now found in many scientific publications, it may easily be said that the community of scientists are setting the standard and paving new grounds of international human and ecological integrity for the race as a whole. The Internet was originally developed with strong emphasis on international scientific, academic collaboration. Astronomers without Borders has emerged out of UN International Year of Astronomy 2009, linking the "we share one sky" amateur groups across national and global internet borders for April 2010, becoming an annual event. The synchrotron light sources, as well as all major international technological facilities, attract and gather their own participants beyond all national, racial, religious, age or gender borders or identities. The newly planned Middle East light source, to be constructed in Jordan, will link the beneficent scientific collaborators of Israel and all Arab, as well as African and other

participant nationalities devoid of political or other affiliation. Truly science is acting as the torch and spearhead of transnational global community. This talk will explore many of these frontier collaborations.

92 *Environmental Transformation, Migration and Conflict: Resource and Identity Issues in Contemporary Diasporas*, **ANITA HAGY FERGUSON** (Southern Oregon University, Ashland, OR 97520; 516 Park Avenue, Medford, OR 97501; hagyferga@students.sou.edu).

Multiple interrelated factors have forced migration throughout history. This study considers how resource scarcity relates to conflict, how scarcity and conflict can propel migration, and how intercultural tensions relate to conflict in sending and receiving countries.

This study further considers a possible link between climate change and conflict considering the predictions of the Intergovernmental Panel on Climate Change, and the posited links between climate change, resource scarcity, resource abundance and dramatic weather events.

Understanding of future climate change as it relates to conflict necessitates an examination of historic migration forces. This study, conducted from June to August 2009, reviews literature drawn from a cross-disciplinary examination of scholarly research and organizational white papers and reports from geography, political science, conflict resolution, intercultural communication and anthropology.

No direct link between climate change and conflict was confirmed in the literature but a clear connection between resource scarcity, conflict, and migration was established, as was the prominence of intercultural and political discord in resource scarcity and migration circumstances. Environmental change is likely to force migration into adjacent developing countries that are already tapped for resources rather than to countries further away which may have better capacity to handle migration, and this heightens the potential for resource-related conflict.

The existence of some commonality amongst migrational push and pull factors allows us to learn from history and present day situations. However, research findings reveal a need to develop integrated migration adaptation and mitigation strategies that address the correlative aspects of migration and conflict forces.

93 *Cartooning Misery: Images of the Great Depression and New Deal*, **MARK ALDRICH** (Department of Economics, Smith College, Northampton MA 01063; MAldrich@Smith.edu).

Popular understanding of economic events is central to the proper workings of a democracy. Editorial cartoonists both reflected and shaped public explanations for the Depression and New Deal. Employing images from a range of newspapers and magazines, this paper shows how contemporaries devised individualistic explanations for the stock market boom and crash, and how they often blamed technological change for depression and unemployment. Cartoons also chronicle the deep division

over the New Deal that remains with us to this day. Collectively these images help explain how popular understanding and misunderstanding of events shaped important economic policies of the 1930s.

General and Interdisciplinary Studies Section
Monday in Science 215 at 3:30 p.m.

94 *The Counter-Intuitive Disharmony of Intuition Research in the Cognitive Sciences*, **JOHN CLEVINGER*** and **CHARLES WALLIS** (Department of Philosophy, California State University, Long Beach, 1250 Bellflower Boulevard, McIntosh Humanities Building (MHB) 917, Long Beach, CA 90840-2408; johnclevenger@gmail.com).

Research on intuition occurs across all the core areas of cognitive science. However, closer inspection of research across and within disciplines reveals a methodological, theoretical, and explanatory morass. We focus upon methodological and explanatory goals of intuition research. Disciplines like cognitive psychology explain intuition by first characterizing forms of intuitive judgments, then determining the reliability (calibration/correlation) of such judgments and extent of that form of intuitive judgment in human problem solving (robustness). Once cognitive psychologists determine the forms, reliability, and generality of intuitive judgments they formulate theories of the underlying cognitive processes in order to explain the data. Paradigmatic examples of this research tradition include Nobel Prize winning work of Tversky and Kahnemann on intuitive judgments of likelihood.

Disciplines like philosophy and linguistics assume the high reliability and universality of domain-specific intuitive judgments. For example, most linguists since Chomsky consider intuitive judgments by native speakers definitive of grammaticality of linguistic utterances. Most philosophers assume that intuitions of individual cases as “knowledge” and “ethical” proves definitive of the epistemic and moral status of those cases respectively. These disciplines seek to exploit intuition to uncover epistemic, ethical, etc. truths.

We conclude our review by offering suggestions as to how intuition research can (and in some cases, has begun to) overcome current pathologies. We urge; (1) the abandonment of some the current, highly untenable theoretic approaches and presuppositions in intuition research, (2) the abandonment of some current, highly untenable methodological approaches, and (3) far greater interdisciplinary interaction and integration.

95 *Individual Heterogeneity of Perceptual/Cognitive/Cogitative/Action Types among Scientists*, **MAGOROH MARUYAMA** (Interactive Heterogenistics, 3833 Nobel Drive, #3333, San Diego, CA 92122; kuniko_maruyama@sbcglobal.net).

There is heterogeneity of individual types in perception, cognition, cogitation, and action (abbreviated as “mindscape

types”). The individual types cut across the boundaries between disciplines. Though there can be as many mindscape types as there are individuals, the following four types and their combinations account for approximately two-thirds of the scientists in each discipline.

H-type	I-type	S-type	G-type
homogenist	heterogenist	heterogenist	heterogenist
hierarchical	independent	interactive	interactive
classificational	random	pattern-maintaining	pattern-generating
competitive	uniquing	cooperative	cogenerative
zero-sum	negative-sum	positive-sum	positive-sum
dichotomization	separation	absorption	outbreeding
one truth	subjective	poly-ocular	poly-ocular

You cannot stereotype each discipline in terms of mindscape types, because each discipline has all individual types.

Education Section
Tuesday in Science 067 at 8:45 a.m.

96 *The UCSD COSMOS Optical Engineering Cluster: A Month-Long Residential Intensive Academic Experience for Talented Grades 9 - 12 Students*, **ERNEST M. KIM^{1*}**, **CLARK C. GUEST²**, **REBECCA L. HAMES²**, **CHARLES W. TU²**, and **PETER N. ILINYKH²** (¹Department of Engineering, University of San Diego, 5998 Alcalá park, San Diego, CA 92110; ²Jacobs School of Engineering, University of California, San Diego, 9500 Gilman Drive, La Jolla, CA 92093; ekim@sandiego.edu).

The California State Summer School for Mathematics and Science (COSMOS) is a 4-week residential summer program open to entering ninth through exiting twelfth-grade high school students with demonstrated interest and achievement in math and science. Located on four University of California campuses (Davis, Irvine, San Diego and Santa Cruz), COSMOS provides students opportunities to excel in student interest topics beyond the typical high school curriculum mentored by outstanding university faculty and researchers. The month-long student interest academic experience at the UCSD COSMOS program is identified as Clusters.

One Cluster (Cluster 5), “Bright Ideas: Light at Work”, introduced students to electro-optical and optical engineering principles and practices. The structure of the academic curriculum was tailored to provide substantive assimilation in optical engineering to allow students to develop complex team projects and to present their findings and accomplishments at the end of the COSMOS program. A particular challenge was to provide a meaningful academic experience for students over a wide age range (grades 9-12).

Detailed student assessments of the 2009 UCSD COSMOS program were conducted before and after the program using an online anonymous survey tool. The difference in student interest for UCSD-wide COSMOS students showed increased interest in engineering of 4% and in physics of 5.4% at the conclusion

when compared to the start of the program indicating increases in student interest in STEM topics.

97 *A Creek Flows Through: Project Based Learning in an Environmental Science Course*, **WILLIAM B. N. BERRY*** and **MATHIAS KONDOLF** (Environmental Science Program, College of Undergraduate Interdisciplinary Studies, Campbell Hall, University of California, Berkeley, CA 94720; bberry@uclink4.berkeley.edu).

Strawberry Creek flows through the Berkeley Campus. The creek is used for a number of field and laboratory studies in the beginning Environmental Science course to study basic hydrology, vegetation (near the stream, mostly non-natives) and water quality. The instructors believe project-based learning is a significant component of the course. Therefore, students conduct two projects involving the creek. One of the student projects is a benthic macroinvertebrate survey of a section of the creek. Benthic organisms are collected, identified and analyzed to assess creek water quality. Students also carry out a project in the creek headwaters in the hills east of the campus. The local geology, floral and soil characteristics and positions of and flow of tributaries to the main creek are studied and plotted on maps. As well, students discuss land use planning issues in their section meetings that follow lectures on land use planning. Students are asked to propose a potential site for a small lab building in the headwaters area using the information from their studies in the potential site area and land use planning information from lectures and discussions in section. Students work in groups in this assignment. Each group makes an oral presentation to the rest of the class. Students also present a written discussion and plan using maps and illustrations.

98 *An Evaluation of the Effect on Student Learning of Using Multiple Textbook Editions in Course Delivery*, **THOMAS F. SCHUBERT, JR.***, **FRANK G. JACOBITZ**, and **ERNEST M. KIM** (Department of Engineering, University of San Diego, 5998 Alcalá Park, San Diego, CA 92110-2492; schubert@sandiego.edu).

The concurrent use of multiple textbook editions in the delivery of technical courses in order to decrease educational cost to students is studied. Three engineering courses at the sophomore and junior level were included in this study: the courses were chosen due to the availability of multiple previous editions of the chosen textbook and the teaching assignments of the faculty members involved in this study. Student surveys were used both to collect general information concerning typical textbook purchasing patterns and to assess the impact of the use of multiple editions on student learning. It was found that, while most students typically purchased used textbooks prior to this study, the average textbook purchase cost for students in this study were approximately cut in half, with more than 40% of the students spending less than \$25 for the textbook. Student learning was assessed and evaluated for a potential negative impact when multiple textbook editions are used concurrently. A majority of

students reported no negative impact of their learning, thought that instruction was edition-neutral, and generally appreciated the choice between textbook editions.

Chemistry and Biochemistry Section **Tuesday in Science 067 at 10:20 a.m.**

99 *Use of X-ray Microanalysis and Infrared Microspectroscopy for Multianalytical Characterization of the Walters Codex, an Ethiopian Manuscript*, **NATASJA A. SWARTZ*** and **TAMI LASSETER CLARE** (Department of Chemistry, Portland State University, 1719 SW 10th Avenue, Portland, OR 97201; claret@pdx.edu).

Since the 6th century AD, holy scribes in the Ethiopian Orthodox Church have recorded sections of the Bible onto goat-skin parchment using red and black ink to produce manuscripts of the Psalter. Many of these manuscripts have been exported for auction as a result of the political and economic instability in Ethiopia over the last two centuries and prior to auction pages have been “illuminated” with overpaintings of biblical scenes, presumably to increase their value. The use of microanalytical techniques of objects of cultural heritage allows an in-depth look into the materials’ elemental composition of artifacts, which can be used to help establish whether materials are original to the object or were added at a later date. Scanning electron microscopy with Energy dispersive x-ray analysis (SEM-EDX) and X-ray fluorescence spectrometry (XRF) were used for elemental analysis of the inks and paints found in the Walters Codex, a 17th century Ethiopian Manuscript. Organic components of samples of the ink and paint were characterized by FT-Infrared microspectroscopy. Based on the materials analysis it seems likely that the overpaintings were added in the first half of the twentieth century. The findings from this project may be used to authenticate and to date other manuscripts.

100 *Going Green in the Organic Lab*, **AUBREY JOHNSTON^{1*}**, **MICHAEL M. McCORMICK²**, **KAREN HAMMON¹**, **DON WARNER¹**, and **OWEN M. McDOUGAL¹** (¹Department of Chemistry and Biochemistry, Boise State University, 1910 University Drive, Boise, ID 83725-1520; ²Homeland Security, Chicago; aubreyjohnston@u.boisestate.edu).

Two laboratory experiments for the organic chemistry curriculum that we use to emphasize the principles of green chemistry are “*Fractional Distillation and Purification of Acetone for Reuse*” and “*Molecular Modeling and Computational Chemistry with Spartan*”. The first of these experiments introduces students to distillation and the 3 R’s of green chemistry (reduce, reuse, and recycle). Distilled acetone is tested for impurities by refractive index, FTIR, and ¹H NMR. The second experiment uses the computer program Spartan to demonstrate organic concepts including reaction transition states, heat of formation, and molecular geometry that are not observable in the traditional “wet” chemistry laboratory. Computational chemistry provides a

hazard free environment for students that emphasize many of the 12 principles of green chemistry. Taken together, these experiments offer greener alternatives to traditional experiments.

101 *Abiotic Organic Synthesis at Seafloor Hydrothermal Systems on Prebiotic Earth*, **JOHN R. HOLLOWAY** (Department of Chemistry and Biochemistry and School of Earth and Space Exploration, Arizona State University, Tempe, AZ 85287; john.holloway@asu.edu).

The intrusion and extrusion of mid-ocean ridge basalt (MORB) magmas at and below the mid-ocean ridge results in production of significant quantities of CO₂ and H₂, creating a fluid in a highly disequilibrium redox state. The CO₂ results from degassing of volatile oversaturated magma; and the H₂ is produced by reaction of dissolved H₂O with FeO in the magma as it crystallizes.

A series of rapid flow experiments at seafloor hydrothermal system conditions demonstrate that reaction of CO₂ and H₂ in the presence of the mineral magnetite, which is present in the basalts, forms significant amounts of methanol.

A second flow experiment showed that MORB glass reacts within days to form smectite clay at seafloor hydrothermal system conditions. A series of static experiments lasting from one day to 6 weeks at 300C and 1000 bars pressure demonstrated that smectite clay interlayers completely collapse in that time period.

A second set of static experiments found that aqueous methanol in contact with smectite clay at SFHS pressure-temperature conditions forms a wide variety of complex organic compounds, and the time dependence of compound synthesis correlates with the collapse of the smectite layers. The most abundant of the compounds is a hexagonal carbon ring molecule, hexamethyl benzene.

This series of experiments demonstrate that organic synthesis reactions could have occurred in a prebiotic ocean on the early Earth.

102 *A Transport Model for the Adsorption of Oxyanions of Arsenic onto Lanthanum and Actinium Oxides and Hydroxides and Calcite*, **ANPALAKI J. RAGAVAN** (Department of Environmental Engineering, University of Nevada, Reno, NV 89557; ragavan@unr.edu).

Removal of trace amounts of arsenic from drinking water is currently a challenging problem. It is required to develop a new adsorbent for arsenic removal from drinking water. A transport model for the adsorption of oxyanions of arsenic onto oxides and hydroxides of lanthanum and actinium and calcite was developed as a function of time and pH from free energy concepts and fundamental principles of classical physics. Gibbs free energies of formation of crystalline phases of tri- and divalent oxyanions of arsenic co-precipitated onto lanthanum and actinium oxides, hydroxides and calcite were estimated from linear free energy relationships developed. Mass transfer coefficients, boundary layer thickness and interfacial dielectric constants which were

functions of initial surface potential were calculated for each system. A good correlation between estimated and experimental free energies of formation was observed. The transport model indicated that the adsorption of oxyanions of arsenic at the oxide-water interface is governed by concentration and chemical potential gradient and ionic size. The developed model is useful in estimating the amount of arsenic that can be immobilized in drinking water systems.

103 *Bifurcation Analysis of Cooperative Binding Enzymes-substrate Systems*, **DAVID BLACKMAN** (University of California Berkeley (retired), 307 W 2nd St., Phoenix, OR 97535-7733; Gribear@mac.com).

Equation describing the behavior of cooperate binding enzymes has been around for a long time. Such enzyme substrate systems have varying affinities based upon two parameters. First the power of the equations labeled p. which is in some way attached to the number of binding sites. The second parameter is the half saturation point, in this analysis labeled K. What the analysis shows that the shape of the bifurcation curve is dictated by these two parameters. What is interesting, what kind of enzymes/substrate systems exhibit the various curve shapes. High values of p. are strong bounders, while low values of p exhibit tentative binding.

Ecology, Organismal Biology and Environmental Sciences Tuesday in Science 057 at 9:05 a.m.

104 *The Origin of the Domestic Dog Revisited*, **JANICE KOLER-MATZNICK** (5265 Old Stage Road, Central Point, OR 97502; jkoler@ccountry.com).

Currently, there is a general consensus that the ancestor of the domestic dog, *Canis familiaris* L. 1758, is the gray wolf, *Canis lupus* L. 1758. Additionally, estimations from DNA sequence dating have placed the time of separation of dog and wolf at about 15,000BP. The proposal that the wolf was domesticated purposefully by humans has largely been discredited. Presently, the most widely accepted hypothesis is the “garbage dump” premise which proposes that a subpopulation of wolves self-domesticated through natural selection after voluntarily changing their niche from hypercarnivore specializing on large prey to scavenger of human food waste.

This presentation points out several unanswered questions and conceptual gaps in the wolf origin and garbage dump hypotheses, and offers a nonconforming dog origin hypothesis consistent with the available data. The alternative, which contains fewer questionable assumptions, is that the ancestor of the domestic dog was a medium-size, generalist canid that shared a recent common ancestor with the gray wolf. Selected behavioral, morphological, molecular, and fossil evidence relative to the competing hypotheses are reviewed.

While neither hypothesis can currently be fully supported

by unequivocal evidence, the scientific community should be concerned that the assumption underlying much of their conclusions could be wrong, especially in canid systematics, genetics and behavior. Until irrefutable evidence is available, Occam's Razor and the "preponderance of evidence" criteria are the only ones that can be applied. Objective investigation of the possibility of an alternative dog ancestor could validate or invalidate many conclusions based on the wolf origin hypothesis.

105 Ecology of Alpine and Subalpine Populations of *Botrychium pumicola* (Pumice Moonwort), a Rare Cascade Range Endemic Fern, SUSAN ROE-ANDERSEN*, DARLENE SOUTHWORTH, and STEWART W. JANES (Department of Biology, Southern Oregon University, 1250 Siskiyou Boulevard, Ashland, OR 97520; susie_roe@hotmail.com).

Subalpine and alpine populations of *Botrychium pumicola* (Ophioglossaceae), pumice moonwort, are restricted to volcanic habitats in the Cascade Range of central and southern Oregon and extreme northern California. The disjunct distribution of this threatened species and its absence from habitat that appears suitable is of conservation and land management concern. The focus of this study was to determine if adjacent areas with and without *B. pumicola* differ in abiotic and biotic factors and to understand how these factors affect the distribution of the species. *Botrychium pumicola* occurs on exposed, windswept volcanic domes, ridgelines and summits, however the species is not restricted to pumice substrates as previously reported. Populations occur on flat to steep slopes up to 27°, and aspects of N, E, SE, S, SW, and W. South, southwest, and west aspects were preferred. Soil potassium levels and soil density were higher, and soil temperatures lower in plots with *B. pumicola*. *Botrychium pumicola* populations occur with a diverse suite of sparse herbaceous perennial plants. A nearest neighbor analysis for *B. pumicola* and its plant associate showed a clumped dispersion. Species richness of plant associates was similar in areas with and without *B. pumicola*. An investigation of the spore bank revealed a low spore density for all populations including one with 1300 *B. pumicola* individuals. The disjunct distribution of *B. pumicola* may be influenced by a variety of factors creating "habitat islands" suitable for growth and development of *B. pumicola* spores, gametophytes and sporophytes and their obligate AM fungal symbionts.

Cell and Molecular Biology

Tuesday in Science 057 at 9:50 a.m.

106 The Roles of Different CLE Domains in Arabidopsis CLE Polypeptide Functional Specificity and Activity, LING MENG¹*, KENNETH C. RUTH¹, JENNIFER C. FLETCHER², and LEWIS FELDMAN¹ (¹Department of Plant and Microbial Biology, 111 Koshland Hall, University of California Berkeley, CA 94720-3102; ²Plant Gene Expression Center, USDA-UC Berkeley 800 Buchanan Street Albany, CA 94710; mengling@

berkeley.edu).

The CLE (CLVATA3/ESR-related) family of plant signaling molecules shares a conserved 14-amino-acid motif, the CLE motif, from which, recent studies suggest a new family of 12-amino-acid plant peptide hormones is derived. In this study 3D structures and interactions of the 12-amino-acid CLV3 peptide and its receptors, CLV1 and CLV2, were predicted. The models show that two CLV3 peptides fit perfectly into the binding clefts of CLV1 and this likely leads to a more stable interacting complex than that with only one CLV3, whereas CLV2 seems to provide a scaffold support for the interaction of CLV3 and CLV1. We also report that Arabidopsis CLE proteins can function in a tissue-specific manner and some CLE factors can act through different receptors. Using domain deletion and swapping we show for the first time that the CLE motif likely determines much of the functional tissue-specificity of the proteins in *planta*. However, we also provide evidence in support of the new view that sequences outside the CLE motif contribute to CLE function and functional specificity *in vivo*. We thus propose that the CLE motif itself determines its functional tissue-specificity by dictating the direct recognition and interaction of each CLE peptide with its optimal receptor(s), whereas the receptor(s) may be available in a tissue-specific manner. On the other hand, the sequences outside the CLE motif may influence CLE function by affecting the processing of CLE peptides, resulting in a change in the availability and/or abundance of CLE peptides in specific tissues and/or cells.

107 *Saccharomyces cerevisiae* Adhesion Properties Influenced by Saccharides, LAURINE J. SHAHMIRIAN¹* and STEVEN B. OPPENHEIMER² (¹Chaminade College Preparatory High School, West Hills, CA 91304; ²Department of Biology and Center for Cancer and Developmental Biology, Northridge, CA 91330; laurine.shahmirian@yahoo.com).

A primary cancer is a tumor mass present at the site of initial conversion of a normal cell to a tumor cell. If all cells remained in the primary tumor, cancer would be of little clinical importance. However, tumor cells do not always remain at the primary site, but move away by metastasis. Metastasis is the spread of a cancer from the original tumor to other parts of the body by means of clumps of cells transported by the blood or lymph. I experimented with a model system for identifying factors that may influence cancer cell clumping, an important component of cancer cell survivability in the bloodstream. *Saccharomyces cerevisiae* is a species of budding yeast most intensively studied as a model eukaryotic organism in molecular and cell biology. Its cell wall consists mainly of glycoproteins, proteins that contain saccharide chains, which are comparable to that of cancer cells. Carbohydrates, specifically d-lactose, d-galactose, d-fructose, d-mannose, and l-methyl glucose were tested as factors to influence the yeast cell clumping. Four drops of yeast and distilled water solution were placed systematically onto a microscope slide. Then, four toothpick tips full of a certain sugar were dissolved into two of the four drops and the other two drops served

as the control. For thirty minutes, between 10 minute time intervals, the drops were observed under a microscope for evidence of clumping or disassociation of the yeast cells. Results show that certain carbohydrates such as d-lactose proved to be effective saccharide inhibitors.

108 Interaction Between Ah Receptor and Stat1 Proteins During Cell Cycle Progression, CHERI L. LAMB* and KRISTEN A. MITCHELL (Dept. of Biological Sciences, Boise State University, 1910 University Drive, Boise, ID 83725-2525; cherilamb@u.boisestate.edu).

The aryl hydrocarbon receptor (AhR) is a soluble, ligand-activated transcription factor that mediates the toxic effects of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) and related chemicals. AhR activity has been shown to regulate cell cycle progression both in vitro and in vivo, although the mechanisms are unclear. We have previously shown that exposure to TCDD suppresses liver regeneration following 70% partial hepatectomy (PH). During liver regeneration, the signal transducers and activators of transcription (STAT) family of transcription factors is important for driving the coordinated expression of genes needed to promote hepatocyte proliferation. The goal of this study was to determine if alterations in STAT signaling contribute to the suppression of liver regeneration observed in TCDD-treated mice. Mice were treated with TCDD (20 ug/kg) or vehicle 24 hr prior to PH and euthanized 12-72 hr after surgery. Remnant liver tissue was homogenized and analyzed by co-immunoprecipitation and western blotting. Levels of phosphorylated STAT1 increased 12 and 24 hr after PH in vehicle-treated mice, whereas phosphorylated STAT1 was not detected in TCDD-treated mice at any time point tested. Furthermore, STAT1 coimmunoprecipitated with AhR in the regenerating liver of vehicle-treated mice 12 and 24 hr after PH. In contrast, STAT1 was not detected in the AhR complex in TCDD-treated mice at any time point tested. Based on these results, it is conceivable that the AhR-STAT1 interaction promotes STAT1 activation, and that TCDD treatment abolishes this interaction, thereby preventing STAT1 phosphorylation, and inhibiting downstream signaling pathways during liver regeneration.

109 Effect of Solar UV Radiation and Nuclear Receptor Signaling in Keratinocyte and Melanocyte Homeostasis, DANIEL COLEMAN^{1,2*}, ZHIXING WANG¹, HYOSANG JANG¹, STEPHEN HYTER^{1,2}, XIAOBO LIANG¹, LIONELLARUE⁴, GITALI INDRA¹, and ARUP INDRA^{1,2,3} (¹Department of Pharmaceutical Sciences, College of Pharmacy, ²Molecular and Cellular Biology Program, ³Environmental Health Science Center, Oregon State University, Corvallis, OR 97331; ⁴Developmental Genetics of Melanocytes, UMR 146 CNRS, Institut Curie, Orsay Cedex, France; colemada@onid.orst.edu).

Unprotected solar ultraviolet (UV) radiation is the primary cause of melanoma and non-melanoma skin cancers. DNA damage resulting from UV can result in genetic mutations, which if unrepaired can lead to abnormal cell proliferation and eventually

cancers such as squamous cell carcinomas and melanomas. Decreased expression of nuclear hormone receptors Retinoic Acid Receptors (RARs) and Retinoid-X-Receptor α (RXR α) has been previously observed in melanomas (Chakravarti *et al*, 2007). In a mouse model, selective ablation of RXR α in epidermal keratinocytes, rather than in melanocytes, resulted in formation of malignant melanomas (Indra *et al*, 2007). Furthermore, in humans, a progressive loss of keratinocytic RXR α expression has been observed during melanoma progression (Hyter *et al*, in revision, PCMR). Those data suggested that nuclear receptor mediated paracrine signaling from keratinocytes to melanocytes is crucial for melanocyte mitogenesis and melanomagenesis.

In the present study, we have investigated the role of RXR α in skin homeostasis in combination with UV radiation. To that end, RXR α was selectively ablated from either keratinocytes or melanocytes in murine skin, and responses were determined at defined time points after UV radiation. We discovered that ablation of RXR α in keratinocytes results in non-cell autonomous effects on melanocyte proliferation in combination (cooperation) with UV, while removal of RXR α in melanocytes results in both cell autonomous and non-cell autonomous effects.

110 Creation of MTN Gene Knock-outs To Probe Autoinducer Effects on Bacterial Virulence, KELLI PEASE¹ and KEN CORNELL² (¹Department of Biological Sciences, and ²Department of Chemistry & Biochemistry, Boise State University, Boise, Idaho 83725-1520; kellipease@u.boisestate.edu).

Intercellular bacterial communication or “quorum sensing” occurs through a variety of soluble small signaling molecules termed “autoinducers”. In response, intracellular signaling cascades are activated that ultimately change gene expression involved in such processes as biofilm formation, motility, virulence and antibiotic resistance. Interrupting these quorum sensing pathways has now become an attractive drug development target, since it may reverse drug resistance phenotypes and ultimately extend the pharmacological life-span of current antibiotics. The enzyme, 5’ Methylthioadenosine/ S-adenosylhomocysteine nucleosidase (MTN) is connected metabolically to methionine and purine salvage, autoinducer 1 and 2 production, and the synthesis of a variety of vitamins that are important to central carbon metabolism. To investigate the role of MTN in quorum sensing dependent cell growth, biofilm formation and virulence in gram negative bacteria, gene knockout strains are being created in the pathogens *Klebsiella pneumoniae* and *Escherichia coli* 0157:H7. These studies will provide insight into MTN as a target for new antibiotic development to .

111 Localization of Thymidine Kinase 1 in Human Lymphoma Cells through Immunogold Labeling Transmission Electron Microscopy, MELISSA TOVAR¹, MORGAN HARDY^{1*}, MICHAEL STANDING², KIM O’NEILL¹, and RICHARD ROBISON¹ (¹Department of Microbiology and Molecular Biology, Brigham Young University, 775 WIDB, Provo, UT 84602; ²Department of Biology, Brigham Young University, 401 WIDB,

Provo, UT 84602; morganhardy6@gmail.com).

The DNA salvage pathway enzyme thymidine kinase 1 (TK1) has proven a reliable marker for cancer cell proliferation. Prior research in our lab has demonstrated significant up-regulation of TK1 on the outer plasma membrane of several types of cancer. Various cancer lines were analyzed for the presence of TK1 on the outer membrane via flow cytometry. Results showed significant binding of TK1 when compared to a normal lymphocyte control.

The purpose of this study was to confirm these results and localize TK1 on the cell surface using immunogold labeling and transmission electron microscopy. Lymphoblastoid cells derived from Burkett's lymphoma (Raji) were cultured, then fixed in formaldehyde and embedded in LR White resin. Sections were cut, collected on nickel grids and stained with CB001, an anti-TK1 mouse monoclonal antibody developed our laboratory. This was followed by staining with a secondary colloidal gold conjugate antibody. As a negative control, grids were stained with an anti-macrophage mouse monoclonal antibody. Observation under the transmission electron microscope revealed a significant presence of TK1 within the cell membrane. TK1 appeared to follow a path from the cell nucleus to the outer membrane. The images we obtained confirm our conclusion that TK1 is present in the plasma membranes of lymphoma cells. In further studies, we will examine other cancer cell lines and also perform immunogold labeling for TK1 on tumor tissue samples.

affects dolphinfish abundance. Furthermore, few studies have analyzed how environmental factors influence dolphinfish abundance in the EPO. Generalized linear models were used to obtain standardized catch rates (catch-per-unit-effort: CPUE) of dolphinfish over the period from 1993 to 2007. Standardized CPUE is commonly assumed to index relative abundance of a population. Dolphinfish abundance in the EPO did not exhibit an overall trend, with high local concentrations occurring off the coasts of Panama and Columbia. Dolphinfish abundance may be relatively greater in these areas due to the presence of increased food resources and floating objects. Results from Kruskal-Wallis tests show that there were significant interannual and seasonal variations in dolphinfish abundance, which could be attributed to the influence of environmental factors. A significant negative relationship existed between dolphinfish abundance and sea-surface temperature. The relationship between dolphinfish abundance and chlorophyll *a* concentrations became significantly positive when lags of both one and two quarters were considered. A significant positive lag of one quarter existed between dolphinfish abundance and salinity measurements. Dolphinfish abundance and Southern Oscillation Index values exhibited a significant positive relationship with a lag of three quarters. Despite no overall trend in dolphinfish abundance between 1993 and 2007, it is important to continue monitoring the status of dolphinfish in the EPO, because they support a number of commercial and recreational fisheries.

CONTRIBUTED POSTER PRESENTATIONS

POSTER SESSION I
MONDAY
12:00 p.m. – 4:00 p.m.
SCIENCE HALL
1st Floor Hallway

ECOLOGY, ORGANISMAL BIOLOGY, and ENVIRONMENTAL SCIENCES

112 *Analysis of the Spatial and Temporal Distributions of Dolphinfishes (Coryphaena hippurus and C. equiselis) in the Eastern Pacific Ocean*, **MARSHALL OLSON** (Department of Marine Science and Environmental Sciences, University of San Diego, 5998 Alcalá Park, San Diego, CA 92110; molson-09@sandiego.edu).

In the eastern Pacific Ocean (EPO), dolphinfish compete with and serve as prey for tuna species targeted by the EPO tuna purse seine fishery; and little is known about how this fishery

113 *An Analysis of Drosophila suzukii Populations in Jackson County, Oregon in 2009*, **WILLIAM REDD OURSLER** (St. Mary's High School, Medford, OR 97504; 252 Strawberry Lane, Ashland, OR 97520; woursler@jeffnet.org).

Drosophila suzukii (Spotted Wing Drosophila or SWD) is an invasive fruit fly species native to Asia. It prefers cool climates. Unlike most other vinegar flies, SWD oviposits on ripening fruit, principally cherries and caneberries. A primary agricultural concern is that the flies will move to wine grapes (Artyom Kopp from UC Davis demonstrated that SWD can oviposit in Thomson seedless grapes). They were first discovered in the western United States in California during 2009 and were first documented in Jackson County, Oregon in late October 2009 by the author. They have spread along much of the West Coast and are now found as far north as Portland, OR. The data herein concerns the response of the Jackson County *D. suzukii* population to temperature in late 2009. Understanding how the flies are affected by environmental conditions, including temperature, is vital to modeling their spread and developing effective methods to combat them. This poster analyzes population data and presents a simple, effective mathematical model explaining the large scale structure of changes in trapped population with respect only to temperature. I find that adult SWD activity is significantly influenced by temperature but that adult fly and egg survival are not affected by drops in air temperature to -10° C for brief periods. A threat to the SWD population would be presented only by severe cold with the mean of high and low

temperatures suspended at less than 2° C for longer than their adult lifespan (3-9 weeks).

114 Forensic Analysis Reveals Hidden Etchings on Whale Tooth Ivory, MARGARET E. “COOKIE” SIMS and DARBY A. MORRELL (National Fish and Wildlife Forensics Laboratory, 1490 E. Main St., Ashland, OR 97520; cookie_sims@fws.gov darby_morrell@fws.gov).

The National Fish and Wildlife Forensics Laboratory supports wildlife enforcement efforts with scientific methodology and documentation for courtroom testimony. Commercially traded ivory is just one category of routine evidentiary material sent to the Lab for species identification. An assemblage of 33 suspected sperm whale teeth was submitted for species identification and a formal report for potential courtroom purposes. The investigator's initial line of inquiry involved recovering evidence of modification (drawings or etchings) on smoothly-sanded teeth. The condition of each tooth's surface was smooth and sanded, with no visible appearance of drawings or etchings on most of the teeth. Upon routine examination, UV light analysis revealed detailed illustrations including portraits and landscapes, Cyrillic script, dates and text. The teeth were forensically identified as sperm whale (*Physeter catodon*), and the drawings were photo documented with visible and UV light sources.

115 Water Mold Diseases of Amphibian Embryos: Interactions among Three Saprolegnia Species, SUSAN F. BRADY*, R. STEVEN WAGNER, DANIEL J. SELSKI, and JAMES E. JOHNSON (Department of Biological Sciences, Central Washington University, 400 East University Way, Ellensburg, WA 98926; belmonts@cwu.edu).

Amphibian species worldwide are declining at alarming rates and although population declines, extirpations, and species extinctions cannot be attributed to any single cause, disease has been identified as an important contributor. Saprolegniasis, a disease caused by water molds, has been implicated in mass mortalities of amphibian embryos and larvae. Until recently, water mold infection experiments have not used accurately identified water molds, which requires genetic analysis, and therefore the pathogenicity, host specificity, or possible pathogen-pathogen interactions of water molds remains unknown. In this study, pathogen-pathogen interactions were investigated by exposing Northern Leopard Frog embryos (*Rana pipiens*) to three genetically identified species of *Saprolegnia* (*S. ferax*, *S. diclina*, and *S. anisospora*) in a fully factorial experiment. Treatments included all possible combinations of the three *Saprolegnia* species and a control treatment with no pathogen present. Embryo survivorship was calculated and larval fitness was assessed for each treatment. Analyses revealed interactions among species of *Saprolegnia* resulting in decreased embryo survivorship in multiple pathogen treatments. In single pathogen treatments of *S. diclina* and *S. ferax* embryo survivorship was not significantly different from the control. In contrast, the combination of *S. ferax* and *S. diclina* significantly reduced amphibian embryo

survivorship as compared to the control treatment ($P < 0.0001$). Understanding these pathogen-pathogen interactions is important in assessing the overall effect of *Saprolegnia* infections on amphibian embryos, and will help determine which *Saprolegnia* species, or combination of species, are responsible for amphibian embryo mortalities.

116 The Effects of a Newly Discovered Parasite (*Apocephalus borealis*) on the Health of Honey Bee Colonies, ANDREW CORE*, JOHN HAFERNIK, JONATHAN IVERS, CHRIS QUOCK, CHRIS SMITH, and TRAVIS SIAPNO (Department of Biology, San Francisco State University, 1600 Holloway Lane, San Francisco, CA 94132; acore@sfsu.edu).

Recent loss of honey bee colonies due to Colony Collapse Disorder (CCD) poses a serious threat to honey bee colonies and many agricultural crops. Honey bees that are affected by CCD abandon their hive, sometimes leaving behind the queen and healthy brood. Recent research suggests that CCD is due to multiple agents. Diseases and parasites have been implicated as playing a central role in CCD (Ratnieks, F. L. W. and Carreck N. L. 2010, vanEngelsdorp, D. and Meixner, M. D. 2009).

Here we investigate a newly discovered parasite of honey bees, the phorid fly *Apocephalus borealis*. This fly lays its eggs in honey bees. Larvae develop internally and eventually kill their hosts. Parasitized bees seemingly demonstrate the primary behavior that characterizes CCD (abandonment of the hive). Studying honey bees on the San Francisco State University campus, we have recorded rates of infection of up to 90% in stranded bees sampled away from the hive. Bees that are sampled when returning to the hive after foraging have a significantly lower rate of parasitism (5%).

Since *A. borealis* is broadly distributed in the U.S. it could be an important factor in health of honey bee colonies. We plan to expand our research on this parasite by collecting samples of bees from beekeepers throughout San Francisco Bay Area. We will measure overall health of hives using percent comb cover of adults and brood, and the ratio of adult to brood cover. By comparing the rate of parasitism relative to hive health, we aim to determine if and how infection by this parasite relates to CCD.

117 Aquatic Gilled Mushrooms in the Rogue River in Oregon: a New Species of Psathyrella, JONATHAN L. FRANK^{1*}, ROBERT A. COFFAN², and DARLENE SOUTHWORTH¹ (¹Department of Biology and ²Department of Environmental Studies, Southern Oregon University, 1250 Siskiyou Boulevard, Ashland, OR 97520; frankjon@sou.edu).

Mushrooms with true gills have been observed fruiting underwater in the clear, cold, flowing waters of the Rogue River in Oregon. Fruiting bodies develop and mature in the main channel, constantly submerged, near aquatic vegetation, fruiting over a period of 11 weeks.

Morphological characters place these specimens in *Psathyrella* (Basidiomycota), a large genus of little brown mushrooms with 414 species in North America. Molecular (DNA sequences

of the ITS region and a portion of the 28S ribosomal DNA gene) and morphological evidence distinguish these fungi as a new species, *Psathyrella aquatica*. The underwater mushrooms form 10-cm long stipes with 1-cm diameter caps. Immature stages have a thin veil that is soon lost; cystidia are ventricose with subacute apices; gills lack pink gill edges.

These are truly underwater mushrooms and not mushrooms fruiting on wood recently washed into the river. Substrates include water-logged wood, gravel, and the silty river bed. Water constrains spore dispersal. Underwater gills and ballistospores indicate a recent adaptation to the stream environment with the spores discharged into a gas bubble under the cap. This particular river habitat combines spring-fed flows, clear, cold, aerated water with woody debris in shallow depths on a fine volcanic substrate. Nitrogen-fixing cyanobacteria near fruiting body attachment sites suggest a source of nitrogen in an otherwise clear stream. This is the first report of gilled mushrooms fruiting underwater and adds to the biodiversity of stream fungi that degrade woody substrates.

118 Age-Specific Association with Potential Adult Habitat in Larval Bocaccio, *Sebastes paucispinis*, in the Southern California Bight, **SEAN M. HITCHMAN**^{1*}, **NATHALIE REYNS**¹, and **RUSS D. VETTER**² (¹Department of Marine Science, University of San Diego, 5998 Alcalá Park, San Diego, CA 92110; ²Fisheries Resources Division, Southwest Fisheries Science Center, 8604 La Jolla Shores Drive, La Jolla, CA 92037; shitchman-10@sandiego.edu).

By studying the distribution of age-specific larvae with potential adult habitat (PAH), estimations can be made in regards to the locations of natal habitat, local hydrography, and retention mechanisms. Identifying natal origins provide basic data in population connectivity studies. By identifying natal habitat for exploited fish species, fisheries management can target areas for construction of marine protected areas (MPAs).

Bocaccio, *Sebastes paucispinis*, are a major component of both commercial and recreational fisheries. However, a recent decline in the bocaccio stock has been so severe that the stocks have been formally designated as “overfished”. Since bocaccio spawn from demersal habitat, distributions of young larvae (<2 days) may give the best estimate of rockfish natal habitat which can be used by fisheries management to target areas where MPAs have the best chance of being successful

Our goal was to use GIS distribution maps coupled with statistical analysis to investigate the association of three age classes of larval bocaccio collected during February 2002-2004 with PAH. Age classes were determined by ageing of the sagittae otoliths. Results show a significant association of young larvae with PAH for all three years of the study. Furthermore, we found high abundances of pre and postflexion larval bocaccio, a possible indication of a good recruitment year. This study demonstrates how young larvae can be used to identify bocaccio natal habitat, a method that can be used to identify natal habitat for other rockfish species.

119 Declining – But Persistent – Atmospheric Contamination in Central California from the Re-suspension of Historic Leaded Gasoline Emissions as Recorded in the Lace Lichen (*Ramalina menziesii* Taylor) from 1892-2006, **A. RUSSELL FLEGAL**¹, **CÉLINE GALLON**¹, **SHARON HIBDON**¹, **ZIKA KUSPA**¹ and **LÉO F. LAPORTE**^{2*} (¹Institute of Marine Sciences, University of California, Santa Cruz, CA 95064; ²Department of Earth and Planetary Sciences, University of California, Santa Cruz, CA 95064; flegal@etox.ucsc.edu, laporte@ucsc.edu).

Analyses of lead concentration and isotopic composition of recent and archived samples of the lace lichen (*Ramalina menziesii*) chronicle more than a century of atmospheric lead contamination in central California. The contamination extends back to 1892 when lead levels in lichen from the northern reach of the San Francisco Bay estuary were 9-19 µg/g, and their isotopic composition (e.g., ²⁰⁶Pb/²⁰⁷Pb = 1.165) corresponded to lead emissions from the Selby smelter (e.g., ²⁰⁶Pb/²⁰⁷Pb = 1.165) that were killing horses in adjacent fields at that time. By the mid-1950s lead isotopic compositions of lichens shifted to the more radiogenic leaded gasoline emissions (e.g., ²⁰⁶Pb/²⁰⁷Pb = 1.18-1.22). Lead concentrations in the lichen then peaked at 880 µg/g in 1976, corresponding to the peak in leaded gasoline emissions in the 1970s. Since then there has been a decline of lead concentration with current levels ranging from 0.2 – 4.7 µg/g. However, the isotopic composition of those samples still corresponds to that of previous leaded gasoline emissions in California. This is consistent with other observations that attest to the persistence of lead contamination from historic industrial emissions in central California.

Our study provides evidence for (1) increase and decline of atmospheric lead contamination in the San Francisco Bay area over the past century; (2) persistence of lead contamination from those historic industrial emissions; and 3) isotopic compositions of the lichen are consistent with those of contemporary waters and sediments in the Bay and its drainage basin, corroborating reports of the legacy of lead contamination in the state from historic leaded gasoline emissions.

120 Stanford University's Water Efficiency Program - 10 Years Later, **MARGARET L. LAPORTE** (Stanford University, Utilities Division, Sustainability and Energy Management, 327 Bonair Siding, Stanford, CA 94305-7272; martyL@bonair.Stanford.edu).

In 2001 Stanford University developed its Water Conservation, Reuse, and Recycling Master Plan (Plan). At that time, Stanford's daily average domestic water use was 2.73 million gallons per day (mgd) and was steadily approaching its allocation of 3.033 mgd from San Francisco Public Utilities Commission (SFPUC). With further campus expansion, rapid action was essential. In less than a year, with help from Maddaus consulting using an end-use model, Stanford embarked on its aggressive path to reduce water use. Four distinct campus user groups and 14 conservation measures were identified. Water savings of 0.57 mgd savings were needed to stay below the allocation, while adding 2 million sq.ft.

of academic space and up to 3000 new housing units for students and faculty. Without conservation, the projected water demand with full build-out would have exceeded Stanford's allocation. The program accomplished 0.59 mgd in domestic water savings, with average daily use in 2009 of 2.14 mgd.

So far, the most successful Plan elements included focusing on cost-effective and highest savings from campus inefficiencies and tracking water use trends; consistent implementation of measures for existing as well as *new* campus infrastructure; testing new technologies prior to widespread installation; and creating efficient tools for data analysis. Additional factors include continued need for changes in behavior and maintaining community engagement to practice water efficiency; improved, cost-effective, water-efficient technologies for fixtures, research equipment, and landscape management; and more effective tools for data analysis. Most elements of this program can be adapted by research institutions to increase long-term water efficiency.

EARTH SCIENCES

121 *A New Kungurian Dyscritellid from the Kaibab Limestone of Southern Nevada*, **MICHAEL S. TOMA*** and **ERNEST H. GILMOUR** (Department of Geology, Eastern Washington University, 130 Science Building, Cheney, WA 99004; egilmour@mail.ewu.edu).

A new species of *Dyscritella* was found in the Kungurian Kaibab Limestone of southern Nevada. Based on more than 70 specimens, this species is distinguished from previously described dyscritellids by the small number of exilazooecia, the number of autozooecia per 2 mm, size range of autozooecia, lack of diaphragms, and ratio of endozone to exozone size. The most similar species are *Dyscritella minuta* Morozova, 1986, southern New Zemlya; *Dyscritella tenuirama* Crockford, 1957, Fitzroy Basin, western Australia; *Dyscritella lucida* Morozova, 1986, Arctic Ocean region; and *Dyscritella savinaensis* Morozova, 1986, southern New Zemlya.

More than 80 species of the trepostome genus *Dyscritella* of the Phylum Bryozoa have been described and named from rocks of the Permian System. Twenty-three of these species have been found in the Artinskian and Kungurian Stages of the Lower Permian. Dyscritellids are extremely cosmopolitan having been described from marine rocks of the boreal, temperate, tethyan, and notal seas in all geographical areas. These bryozoans occur with brachiopods, crinoids, echinoids, conodonts, and mollusks and probably lived in the neritic environment of the shallow shelf.

EDUCATION

122 *Using Inquiry to Foster Student Critical Thinking and Content Knowledge in Undergraduate Fundamental Biology*, **MIAO GAO^{1*}**, **IAN QUITADAMO¹**, and **RALF GREENWALD²** (¹Department of Biological Science, ²Department of Psychology,

Central Washington University, 400 E. University Way, Ellensburg, WA 98926; gaom@cwu.edu).

Inquiry, as a set of processes and activities researchers engage in during investigative science, has become a national focus in science education. The role of inquiry in promoting key outcomes of higher education like the ability to think critically and improve scientific knowledge to make rational decisions in life is incompletely understood. Few studies show inquiry teaching helps students to develop science knowledge and thinking skill. The intent of this study was to investigate the extent to which inquiry implementation affects student critical thinking and content knowledge in undergraduate biology courses. Using the same instructor and case studies in both, critical thinking and content knowledge was compared between full inquiry (n=19) and partial inquiry (n=19) lab sections. Full inquiry students completed quarter-long group research projects, wrote collaboratively, and presented research posters, whereas partial inquiry students completed half quarter-long group projects and presented using PowerPoint. The NSF-funded Critical thinking Assessment Test (CAT) was used to measure critical thinking level at the beginning and end of the term. Content knowledge was assessed using three common course exams, including two midterms and a final. Results showed both full and partial inquiry teaching methods improved student critical thinking ability in only 9 weeks of biology coursework. No significant difference in content knowledge were shown in exams 1 and 2 between both sections; however full inquiry students performed higher on the final exam than did partial inquiry students.

123 *A Flow Visualization Project in Fluid Mechanics*, **FRANK JACOBITZ***, **BRYCE ABRAHAM**, **JEFF BENTZ**, **LAUREN DORUTH**, **MATT FOSTER**, **MATT GABBARD**, **MICHAEL JAROSINSKI**, **ADAM JONES**, **YEHIA OMAR**, **BRYAN REED**, **AVERI THOMAS**, **VICKY VARGAS**, and **CASEY WEISS** (Mechanical Engineering Program, University of San Diego, 5998 Alcalá Park, San Diego, CA 92110, jacobitz@sandiego.edu).

Flow visualization is an important tool in advancing our understanding of fluid motion gained from experiments and simulations. It can also serve in education to demonstrate the features, complexities, and beauty of our subject, thereby sparking the curiosity of students. This contribution shows the work of students enrolled in a single-semester, junior-level fluid mechanics course at the University of San Diego. The students designed and built the experimental setup, observed the fluid motion, and captured the flow in images. We acknowledge many ideas from the flow visualization course of Jean R Hertzberg at the University of Colorado, Boulder (<http://stripe.colorado.edu/~hertzber/>).

HEALTH SCIENCES

124 *Gender and Racial/Ethnic Disparities in the Association between Body Mass Index and Walking Impairment in Persons*

with Knee Pain and Stiffness: A Population-Based Study, **STEPHEN J. MOREWITZ** (Department of Nursing and Health Sciences, California State University, East Bay, 25800 Carlos Bee Blvd., Hayward, CA 94542; morewitz@earthlink.net).

Researchers are investigating ways to overcome disabilities in the U.S. population and across the world. Overweight and obesity is associated with sedentary lifestyles and increased physical impairment, especially among persons with lower extremity problems. However, investigators lack information about possible gender and racial/ethnic disparities in body mass index and disability in these individuals. This study tests the null hypothesis that there are no gender and racial disparities in body mass index and self-reported walking impairment among persons with knee pain and stiffness. Data from the population-based 1998 National Health Interview Survey (N=30,534 adults) were used. Descriptive and correlational procedures evaluated the possible relationship between body mass index and walking among persons with knee pain and stiffness, after adjusting for age and other predictors. The null hypothesis was rejected. Among African-American females with knee pain and stiffness, body mass index was associated with greater difficulty in walking ¼ mile without special equipment ($r=+.149$, $p<.001$, $N=420$). Among females from other racial/ethnic groups (besides white) who have knee pain and stiffness, body mass index also was associated with greater difficulty in walking ¼ mile without special equipment among ($r=+.154$, $p<.044$, $N=123$). These differences remained significant after controlling for possible predictor variables. The results highlight the vulnerability of females from non-white ethnic and racial groups who have knee problems and increased body mass index. Health care providers should develop interventions for these groups.

125 *A Comparison of Oral Health Status and Oral Health Quality of Life Based on Clinical Determinants in a National Probability Sample*, **MARK S. ORTEGA***, **RAUL LEAL-RODRIGUEZ***, **YI LUO**, **HONGHU LIU**, and **MARVIN MARCUS** (California Endowment Pipeline Program, UCLA School of Dentistry, Division of Public Health and Community Dentistry, 10833 Le Conte Avenue, Los Angeles, CA 90095; mark.steven.ortega@gmail.com, vector0x@csufresno.edu).

Overall oral health status and quality of life oral health measures are two important ways of accessing perceived oral health status. This cross-sectional study compares these two perceived oral health measures using clinically determined oral health findings that are part of the examination portion of NHANES 2003-2004. This weighted sample represents 162 million people. Two separate dependent variables were utilized in this study: 1) oral health status (OHS) as defined by, “How would you describe the condition of your teeth?” and 2) a series of questions assessing oral health quality of life (OHQL) in terms of social and physical functioning, and pain. The correlation between the two dependent variables was 0.30145; although statistically significant, it is not very strong. 72 million people rated their OHS either poor or fair, and the average OHQL was 13.7 (3-15). A

bivariate regression analysis used number of functional contacts, bleeding upon probing, and examiner recommendations as independent variables, along with covariates of gender, age, income, education, and ethnicity. The OHS had more significant associations with the clinically determined independent variables and the covariates, whereas the association with the OHQL was not as strong. In terms of OHS, 82.4% of the independent variables and covariates were significant. By contrast, only 31.5% of them were significant for OHQL. The concept of OHS is more directly related to these clinically determined findings than the OHQL, which is a much more dynamic measure. This is a partial model and a comprehensive model will later be presented.

126 *Psychobiology of Immigration Stress: Relevance to Nasopharyngeal Carcinoma (NpC) Prevalence*, **RAISA AVEZOVA^{1*}**, **OLUWADAYO OLUWADARA¹**, **GEORGE KOSSAN¹**, **WILLIAM YOON¹**, **JAVIER IRIBARREN²**, and **FRANCESCO CHIAPPELLI¹** (¹Division of Oral Biology & Medicine, University of California, Los Angeles (UCLA) School of Dentistry, 10833 Le Conte Avenue CHS, Los Angeles, CA 90095; ²UCLA Chicano Studies Research Center, 100 Stein Plaza Driveway, Los Angeles, CA 90095; ravezova@ucla.edu).

Immigration can be traumatic as leaving one’s ethnic roots and social support system bring about profound psychological and emotional stresses. This study begins a systemic characterization of the psychobiological biomarkers of immigration stress, which may significantly increase risk of nasopharyngeal carcinoma (NpC), cancer of the soft palate. Our model posits that psycho-emotional states modulate brain-mediated regulation of hormonal responses, altering our immune surveillance processes. We hypothesize that the psychobiological mechanism by which immigration stress raises NpC prevalence involves blunted immunity against Epstein Barr Virus (EBV), an important co-factor in the etiology of NpC. Since epidemiological data indicate high prevalence of EBV infection in Central and South America, Latino immigrants may be at especially high risk for NpC. The objective of this study was to test this working hypothesis by developing new and improved modes of NpC detection based on the proteomic signature of this cancer. We screened pathological biopsy specimens by immune biomarker profile to establish predictive characterization of NpC. Initial experiments used immunohistochemistry and tissue microarray to evaluate tumor cell mitosis and EBV infection biomarkers. For data analysis, stained cells were counted and signals of the stained tissue scored as in Oluwadara et al. (Bioinformatics, 2010). Statistical tests evaluated the effectiveness of both molecular markers of intracellular signaling and cell cycle traversal, and EBV, in detecting oral premalignant and malignant NpC lesions. The results of this research emerge novel critical information toward improved early diagnosis of NpC in the Latino immigrant population at risk and propose improved evidence-based treatment interventions for this soft palate tumor.

127 Association Between Body Mass Index and Demographic Characteristics in a National Sample of Children, Ages 6-11, ANAMEVYS ECHEVARRIA*, **LUCELIA RIVERA***, **HONGHU LIU, YI LUO, and MARVIN MARCUS** (California Endowment Pipeline Program, Division of Public Health and Community Dentistry, UCLA School of Dentistry, 10833 Le Conte Avenue, Los Angeles, CA 90095; lriviera2@ucmerced.edu; aeche009@fiu.edu).

According to the National Health and Nutrition Examination Survey (NHANES), there is an increasing trend in obesity prevalence in children throughout the United States. This study analyzed NHANES data from 2003-2004, and examined the relationship between body mass index (BMI), caries experience, and demographic characteristics. Twenty-three million children were in our weighted sample, with an average BMI of 18.6, ranging from 16.2 in 6-year olds to 21.3 in 11-year olds. In our sample, children had a higher BMI than the recommended health average. We used bivariate regressions with caries experience (caries plus restorations) as the dependent variable, with BMI and various demographic characteristics. There is a significant negative relationship between caries experience and BMI ($P < 0.05$). There are also negative relationships between caries experience/BMI with children who see a dentist within a year ($P < 0.05$), children who have seen the dentist in the past 3-5 years ($P < 0.01$), and those within the middle income range. Those findings indicate that BMI is related to certain behaviors, particularly in terms of access to dental care and family income. People who utilize dental care have less body weight. These may be indicative of the awareness of both the need for treatment, as well as the need to have lower body weight. However, these relationships are not linear, but are rather selective. Therefore, those having less body weight, have more caries experience. These findings represent a partial model. A full model will be presented later.

128 Demographic and Behavioral Factors and Active Caries in a National Sample, DENISE I. ROBLES*, **MONIQUE R. BELIN***, **YI LUO, HONGHU LIU, and MARVIN MARCUS** (California Endowment Pipeline Program, Division of Public Health and Community Dentistry, UCLA School of Dentistry, 10833 Le Conte Avenue, Los Angeles, CA 90095; roblesdi@gmail.com; monique.belin@email.saintleo.edu).

According to the National Health and Nutrition Examination Survey (NHANES) 2003-2004, there were approximately 16 million heavy drinkers in the United States. Alcohol abusers have been reported to have a higher than usual level of decayed, missing, and filled teeth (DMFT). This study examines the relationship between alcohol use and active caries, considering demographic and behavioral characteristics, in a national probability sample. The design is a cross-sectional analysis utilizing data sets from NHANES 2003-2004. This represents a total weighted population of 161 million adults age 20 and above in the United States. Our dependent variable is the presence or absence of active decay. Using a multivariate logistic regression analysis with complex survey design, the weighted results indicate that

alcohol is not a significant factor when demographic and behavioral variables are included. Males were 38% more likely than females to have active caries while those with dental insurance were 25% less likely; those who had a higher income and education were less likely (25% and 30% respectively); and those who exercised regularly were 24% less likely to have active decay. Although bivariate analyses indicated that alcohol use was associated with active caries, the logistic model showed that both demographic variables along with dental insurance and exercise were key variables associated with the presence of active caries. These findings provide insight into the relationship between alcohol use and caries in terms of the important covariates identified previously.

129 Characterizing the Role of Monocytes in Immune Responses Against Oral Tumors, CHELCEE BAKER^{1*}, AIDA ARASTEH², HELEN TSENG², and ANAHID JEWETT² (¹Howard Hughes Medical Institute Pre-College Science Education Program, UCLA School of Dentistry; ²The Weintraub Center for Reconstructive Biotechnology, UCLA School of Dentistry, Box 951668, Los Angeles, CA 90095; baker2926713@aol.com).

This study aims to characterize: the role of monocytes in immune responses against oral tumors, and the interaction between monocytes and Natural Killer (NK) cells. The objectives are to observe: if monocytes, by inducing NFκB in tumor cells, cause resistance of oral tumors against NK cell-mediated cytotoxicity, and whether there are differences between CD16+ and CD16- monocytes in inducing NFκB. NFκB plays a significant role in tumor cell survival. Blocking NFκB makes oral tumors more susceptible to tumor cell lysis. Monocytes are major inducers of cytokines when cultured with NK cells and oral tumors. They raise the overall survival and function of NK cells and oral tumor cells. The experiment consisted of depleting CD16+ monocytes, which decreased the levels of IL-6, and may indicate decreased ability of oral tumors to upregulate NFκB. CD16- and total monocyte population triggered increased levels of IL-6 and TNF-α in co-cultures. This was determined using IL-6 and TNF-α enzyme-linked immunosorbent assays (ELISA) test. However, when oral tumors are co-cultured with monocytes, they induce resistance of oral tumors against NK cell-modulated cytotoxicity, but induce significant levels of cytokine secretion. We found that monocytes increased the levels of both IL-6 and TNF-α secretion because monocytes protect tumor cells so they can continue to grow and secrete cytokines. Therefore, monocytes are important effectors in the survival of tumor cells and are key immune effectors, which down-modulate the function of NK cells against oral tumors. Due to decreased NK cell activity by monocytes, oral tumors can continue to survive, grow and secrete cytokines, which will further sustain the growth of oral tumors.

130 Regulatory T Cells in Recurrent Aphthous Stomatitis, YESICA JUAREZ^{1*}, AUDREY NAVARRO², and FRANCESCO CHIAPPELLI² (¹Howard Hughes Medical Institute

Pre-College Science Education Program, 10833 Le Conte Avenue, 63-007 CHS, Los Angeles, CA 90095; ²UCLA School of Dentistry, 10833 Le Conte Avenue, 63-014 CHS, Los Angeles, CA 90095; yessicajuarez3@yahoo.com).

Recurrent aphthous stomatitis (RAS), more commonly known as canker sores, are ulcers that appear inside the mouth. They are usually round, small, shallow, and painful lesions. Immunohistology was performed to identify invading FoxP3+ lymphocytes, because this marker is expressed by regulatory T cells (Tregs), whose role includes regulating cellular immune surveillance processes. **Objective:** The objective was to find out if regulatory T cells, which fight off inflammatory diseases, are found in recurrent aphthous stomatitis. **Methods:** Immunohistochemistry was performed to locate the nuclear biomarker FoxP3 in lymphocytes found in recurrent aphthous stomatitis lesions. Pictures were taken from the slides and then they were examined with fractal analysis. Fractal Analysis provides information about fractal dimension; that is, how big the nuclei were, which is interpreted as one sign of the activation level of the cell. Fractal Analysis also provides information about standard deviation, which is where the nuclei were located. This information is helpful in understanding where recurrent aphthous stomatitis occurs the most. **Results:** Slides obtained from recurrent aphthous stomatitis lesions were compared to slides generated from lesions of Radiation Induced Oral Mucositis (RIOM). RIOM is a more severe type of lesion compared to recurrent aphthous stomatitis. Fractal analysis results demonstrated that it appears that recurrent aphthous stomatitis have larger nuclei therefore more regulatory T cells are more active. Since there is more active Tregs in RAS this ulcer has a faster anti-inflammatory healing process. **Conclusion:** Novel treatment interventions for RAS lesions might involve activating Tregs.

131 Tumor-Suppressive microRNAs Inhibit Cancer Cell Growth, DARRON KINNEY^{1*} and KI-HYUK SHIN² (¹Howard Hughes Medical Institute Pre-College Science Education Program; ²No-Hee Park Laboratory, UCLA School of Dentistry, Box 951668, Los Angeles, CA 90095; darronkinney@gmail.com).

Oral cancer is the sixth most common cancer worldwide and detected in mouth, tongue, and jaw area of oral cavity. Oral cancer is usually treated with surgery, radiation, and chemotherapy. MicroRNAs (miRNAs) are short 18-24 nucleotides RNA molecules that post-transcriptionally regulate protein expression. MiRNAs have recently been discovered to be down-regulated in human cancer and to function as tumor suppressors. The purpose of this study is to investigate the effects of tumor-suppressive miRNAs, miR-34a, miR-137, and miR-181a, on the growth and radiation sensitivity of oral cancer cells. SCC-4, a human tongue cancer cell line, was infected with lentiviruses expressing miR-34a, miR-137, miR-181a, or no miRNA as a control. The infected cells were then treated with radiation, and their proliferation and death were measured using both cell-counting and methyl thiazol tetrazolium (MTT) assay. The assays revealed

that both tumor-suppressive miR-34a and miR-181a inhibited oral cancer cell growth, but miR-137 did not. MiR-34a and miR-181 were also shown to sensitize oral cancer cells to radiation treatment, while miR-137 does not affect the radiation sensitivity of oral cancer cells. This study indicates a novel therapeutic application of miRNAs for oral cancer.

132 Micro-electrode Array Impedance as a Measure of Local Environment and Effects of Micro-stimulation, REBECCA A. PARKER^{1*}, RICK VANWAGENEN² and BRADLEY E. GREGER³ (¹Interdepartmental Program in Neuroscience, University of Utah, 20 N MREB Room 417, Salt Lake City, UT 84132; ²Blackrock Microsystems, 391 Chipeta Way, Salt Lake City, UT 84108; ³Department of Bioengineering, University of Utah, 20 S 2030 E Room 108, Salt Lake City, UT 84112; parker.becca@utah.edu).

In order to successfully implement cortically implanted micro-electrode array (MEA) technology for clinical neural prosthetics, MEAs must function safely and reliably for the lifespan of the prosthetic. It has been observed that 1 kHz impedance measurements, often used as a metric of functionality, fluctuate over time and decrease with the application of micro-stimulation. To elucidate how electrode alteration and tissue response may contribute to these dynamics, we performed a series of *in vitro* and *in vivo* impedance measurements and micro-stimulation using platinum and sputtered iridium oxide film MEAs.

Impedance measurements were taken in physiologically buffered saline using a Cerebus data acquisition system (Blackrock Microsystems) to determine baseline. MEAs were then pneumatically inserted into rat cortex and readings taken. The MEA was cleaned and impedances measured. MEAs were then inserted into agarose and readings were taken. Impedances were then measured in rat brain homogenate. Finally, selected electrodes on the MEA were micro-stimulated and impedances measured.

Impedances returned to baseline following cortical and agarose implantation and cleaning, though they did rise while the MEA was in both cortex and homogenate. This suggests that tissue components contribute to changes in impedance during implantation. It further implies that the process of insertion is not causing gross damage to the MEA. Impedances dropped on stimulated and non-stimulated electrodes following stimulation, and did not return to baseline after multiple days. This suggests that stimulation causes changes to electrodes that may prove problematic for the implementation of MEAs in neural prosthetics.

133 The Use of Network Visualization Methods to Represent the Association of Inbreeding with Lung Fibrosis Incidence in Beagle Dogs that Inhaled ²³⁸PuO₂ Or ²³⁹PuO₂, DULANEY WILSON^{1*}, ANDREA BRIGANTIC¹, ALAN CHAPPELL² and WILLIAM F. MORGAN¹ (¹Biological Sciences Division, Pacific Northwest National Laboratory, 902 Battelle Blvd, P.O. Box 999, MSIN J4-02, Richland, WA 99352; ²National Security

Directorate, Pacific Northwest National Laboratory, BSRC/HARC, Seattle, WA; dulaney.wilson@pnl.gov).

Health effects in humans from exposure to internally deposited plutonium have been estimated from limited data from epidemiologic studies. Studies of the biological behavior and subsequent health effects in beagle dogs were intended to supplement and complement the human data. Although care was taken to control inbreeding, the beagle dog gene pool was limited compared with human populations. The relationship between degree of inbreeding and lung fibrosis after plutonium inhalation has been evaluated with statistical methods to determine if a genetic or familial component would explain the relationship. In addition, network visualization methods may provide a quick display of associations between disease and familial or genetic susceptibilities. Two methods were tested to determine the ease of use and acceptability. One method investigated involved using Cytoscape, an open source program that was designed, in part, to visualize molecular interactions. Cytoscape proved to be easy to use and produced easily understandable images although the generation of each image required extensive data manipulation. A second method involved converting data on canine offspring relationships to an ontologically backed entity-relationship representation. Both methods required intensive computing before mapping the relationships but allowed rapid identification and intuitive quantification of the degree of inbreeding among dogs that developed lung fibrosis after plutonium inhalation. In addition, the second method allowed visualization of the data as well as semantically enhanced pattern querying.

This work was supported by Radiation Biology and Biophysics, U. S. Department of Energy, Pacific Northwest National Laboratory's Laboratory Directed Research and Development Program and funding from a pilot project awarded by the National Institutes of Health, National Institute for Allergy and Infectious Disease grant U19 AI 067770, Centers for Medical Countermeasures against Radiation.

POSTER SESSION II

TUESDAY

12:00 p.m. – 4:00 p.m.

SCIENCE HALL

1ST Floor Hallway

PHYSICS and MATERIALS SCIENCE

134 *Endotoxin Detection using Electrochemical Method and the Effect of Nanoscale Confinement*, GAURAV CHATTERJEE^{1*}, SRIVATSA AITHAL¹, LILIAN GONG², SUTAPA BARUA³, KAUSHAL REGE³ and SHALINI PRASAD^{1,4} (¹Department of Electrical, Computer and Energy Engineering, Arizona State University, P.O. Box 875706, Tempe, AZ 85287-5706; ²Wellesley College, Wellesley, MA 02481; ³Mechanical, Chemical, Aerospace and Materials Engineering, Arizona State University,

Tempe, AZ 85287-8706; ⁴Department of Electrical and Computer engineering, Portland State University, Portland, OR 97201; Gaurav.Chatterjee@asu.edu).

The goal of this project is to design a nanotextured, electrical, label-free detection system for detection of low doses of endotoxins. Endotoxins are large, heat-stable lipopolysaccharides, which are the major component of cell walls of gram negative bacteria. Endotoxin detection have broad food safety and disease diagnostic application.

We have developed a label free electrochemical based endotoxin sensor, which detects the endotoxin using Electrochemical Impedance Spectroscopy. In electrochemical impedance spectroscopy the impedance between the electrodes at different frequency points is measured. This frequency response changes with the property of the nanolayers on the electrode we use this property to detect endotoxin binding to the detector surface.

We have designed a multi-scale architecture detection platform comprising of a base microelectronic platform on to which the nanoporous alumina membranes are overlaid. We have adopted layer-by-layer chemistry to immobilize endotoxins onto the detector surface. The endotoxin in the solution is immobilized on the surface of the electrode for detection using a sandwich of polymers PAA (anionic polymer)-and a cationic polymer. Various cationic polymers that have been synthesized have been evaluated to identify the polymer which demonstrates maximum affinity to endotoxins. These polymers are oppositely charged to that of the endotoxin which makes the endotoxin bind to the nanotextured alumina surface coated with the cationic polymer. The nanoporosity of the alumina membrane which was functionalized with these polymers contributes towards enhancing the sensitivity of detection. The increased sensitivity can be attributed to the increase in the surface area and increase in the number of binding sites within the membrane.

135 *Biogenic Silica Incorporated Bio Sensors for Ultra Sensitive Protein Detection*, GAURAV CHATTERJEE^{1*}, VINDHYA KUNDURU¹, SRIVATSA AITHAL¹, KAI-CHUN LIN², B. L. RAMAKRISHNA² and SHALINI PRASAD^{1,3} (¹Department of Electrical, Computer and Energy Engineering, Arizona State University, P.O. Box 875706, Tempe, AZ 85287-5706; ²Mechanical, Aerospace, Chemical and Materials Engineering, Arizona State University, Tempe, AZ 85287-8706; ³Department of Electrical and Computer Engineering, Portland State University, Portland, OR 97201; Gaurav.Chatterjee@asu.edu).

Biogenic silica (diatoms) are single celled algae with rigid cell walls made of amorphous silica. They offer great symmetry, hierarchy and porosity, combined with excellent physical and electrical isolation. These properties make them amenable to nanoporous biosensors. We have designed the physical geometry utilizing them into protein detection.

We have explored the impact of nanoscale confinement on biomolecule detection. Recent research has indicated that improved detection parameters such as sensitivity, selectivity can be achieved in electrical detection by employing size based

confinement techniques in nanomaterials. We have previously observed that nanoporous membranes, while improving biomolecule detection sensitivity, had various issues regarding diffusion, transport and selectivity. We address those issues using biogenic silica as the nanoporous material.

We have incorporated a nanoporous biogenic silica membrane onto a microelectronic platform. By interfacing the diatom membrane with the microelectronic platform we have generated arrays of nanoscale confined spaces into which we have trapped size matched biomolecules. We have demonstrated that such a multi scale architecture system can be engineered to function as an electrical biosensor using the principle of electrochemical impedance spectroscopy. We have demonstrated the functionality of the structure as an electrical biosensor by using the inflammatory marker C-reactive protein as the test protein. We have observed that the detection capabilities of the diatom based biosensor to be far improved as compared to the detection performance with an alumina membrane. We have demonstrated limit of detection in the pg/ml regime up to the µg/ml regime. We have demonstrated detection of CRP from purified as well as serum samples.

INDUSTRIAL SCIENCE and TECHNOLOGY

136 *Co-precipitation of Oxyanions of Arsenic(III) onto Lanthanum and Actinium Oxides*, **ANPALAKI J. RAGAVAN** (Department of Environmental Engineering, University of Nevada, Reno, NV 89557; ragavan@unr.edu).

Equilibrium constants for modeling co-precipitation of oxy-anions of arsenic (III) onto lanthanum and actinium oxides were estimated from linear correlations of standard

state Gibbs free energies of formation, ($\Delta G_{f, M^X(ss)}^0$) of the co-precipitates. The co-precipitation reactions were derived from Farley et. al. [J. Colloid Interface Sci. 106 (1985) 226] co-precipitation model, which are based on surface complexation model coupled with solid solution representation for co-

precipitation on the solid surface. The $\Delta G_{f, M^X(ss)}^0$ values were correlated through the following linear free energy relations,

$\Delta G_{f, M_2(O)_3(ss)}^0 - 35.1 r_{M^{3+}} = 0.85 \Delta G_{n, M^{3+}}^0 - 1575.5$
 where 'ss' stands for the end member solid component of co-pre-

cipitate, $\Delta G_{f, M^X(ss)}^0$ is in kJ/mol, $r_{M^{3+}}$ is the Shannon-Prewitt radius of Lanthanum or actinium (M^{3+}) ion in a given coordination state (nm), and $\Delta G_{n, M^{3+}}^0$ is the non-solvation contribution to the Gibbs free energy of formation of M^{3+} . Results indicate that the above co-precipitation correlations are useful for estimating co-precipitation of arsenic at solid water interface.

137 *Room Temperature Nucleic Acid Storage Technology and Sustainable Practice by Scientific Laboratories*, **AUTUMN NAILES^{1*}**, **SUPANIGAR RUANGSRI²**, and **ICHIRO NISHIMURA²** (¹Howard Hughes Medical Institute Pre-College Science Education Program, UCLA School of Dentistry; ²The Weintraub Center for Reconstructive Biotechnology, UCLA School of Dentistry, Box 951668, Los Angeles, CA 90095; A2fall@aol.com).

Laboratory freezers in today's research laboratories, on average, consume two-thirds of the energy on campus and use a considerable amount of space. Because the majority of the contents in such freezers are often archival DNA samples, sustainable laboratory practices may be explored if ambient temperature storage of plasmid DNA becomes practical. The aim of this study was to evaluate the integrity and functionality of plasmid DNA stored in an ambient temperature setting using a commercially available anhydrobiosis-based chemical stabilization system. Ten plasmid DNA samples were stored for 1 week under the anhydrobiosis condition at room temperature or under -80°C. Agarose gel electrophoresis, NanoDrop 2000 spectrophotometer and bacterial transformation were used to compare the integrity and functionality of plasmid DNA. The results from the agarose gel electrophoresis and a 260/280 ratio from the spectrophotometer both demonstrated that the plasmid DNA samples remained intact with the 260/280 ratio from the spectrophotometer above 1.8. The number of colonies grown from the bacterial transformation did not differ significantly, allowing for the usage of downstream experiments. The data suggest that anhydrobiosis-based ambient temperature DNA storage may be a practical option at least for plasmid DNA. Because this system limits the number of rehydration, plasmid DNA transformation may be recommended and a new batch should be re-stored. The new ambient temperature DNA storage system may contribute to the reduction of laboratory freezers and thus the energy consumption, leading to a better sustainability practice in scientific laboratories.

CHEMISTRY and BIOCHEMISTRY

138 *Equilibrium Conformational Dynamics in an RNA Tetraloop from Massively Parallel Molecular Dynamics*, **ALLISON J. DEPAUL¹**, **ERIK J. THOMPSON²**, **SARAV S. PATEL^{1*}**, **KRISTIN HALDEMAN³**, and **ERIC J. SORIN¹** (¹Department of Chemistry and Biochemistry, ²Department of Chemical Engineering, and ³Department of Mathematics and Statistics, California State University Long Beach, Long Beach, CA 90840-9401; patel.sarav@gmail.com).

Conformational equilibrium within the ubiquitous GNRA tetraloop motif was simulated at the ensemble level, including ten thousand independent all-atom molecular dynamics trajectories totalling over 110 microseconds of simulation time. This robust sampling reveals a highly dynamic structure comprised of fifteen conformational microstates. We assemble a Markov

model that includes transitions ranging from the nanosecond to microsecond timescales and is dominated by six key loop conformations that contribute to fluctuations around the native state. Mining of the Protein Data Bank provides an abundance of structures in which GNRA tetraloops participate in tertiary contact formation. Most predominantly observed in the experimental data are interactions of the native loop structure within the minor groove of adjacent helical regions. Additionally, a second trend is observed in which the tetraloop assumes non-native conformations while participating in multiple tertiary contacts, in some cases involving multiple possible loop conformations. This tetraloop flexibility can act to counterbalance the energetic penalty associated with assuming non-native loop structures in forming tertiary contacts. The GNRA motif has thus evolved to not only readily participate in simple tertiary interactions involving native loop structure, but also to easily adapt tetraloop secondary conformation in order to participate in larger, more complex tertiary interactions.

139 *Using NMR Techniques in a Model Biphasic System to Find Partition Coefficients*, **EMILY DRUSSEL^{1*}**, **BRYAN MARTIN¹**, **DAVID LUKER¹**, **MICHAEL HILL²**, **GERRY CHINGAS¹**, and **OWEN McDOUGAL¹** (¹Department of Chemistry and Biochemistry, Boise State University, 1910 University Drive, Boise, ID 83725; ²Boise Technology Inc., Nampa, ID 83687; Emilydrussel@u.boisestate.edu).

A model biphasic system was studied using acetone on 1-octanol and water. The partition coefficient was found using z-axis single pulse slice-selective spatially resolved excitation (SPS³RE) nuclear magnetic resonance (NMR) spectroscopy. This SPS³RE NMR experiment allows for the collection of a one-dimensional look at ¹H spectra at defined spatial intervals along the z-axis, providing analyte quantitation through the entire sample. With this in mind, the concentration of acetone was characterized as a function of spatial location from the two-phase interface leading to the determination of partition coefficients by signal integration. This system was then expanded to analyze the hydrolysis of parathion in a biphasic system of parathion and deuterated sodium hydroxide with varying amounts of *tert*-butylammonium chloride. From this, the utility of a simplified, slice-selective pulse for analyzing heterogeneous samples is observed.

CELL and MOLECULAR BIOLOGY

140 *Expression and Purification of West Nile Virus prM Candidate Antigen for an Oral Vaccine*, **REECE KNIPPEL^{*}** and **KENNETH CORNELL** (Department of Chemistry and Biochemistry, Boise State University, 1910 University Dr, Boise, ID 83725; ReeceKnippel@u.boisestate.edu).

West Nile Virus (WNV) is a member of the mosquito borne flaviviruses that has caused almost 30,000 total cases of infection and 1,000 deaths since it emerged in the US in 1999. At this time no vaccine is available for humans. An oral or intranasal vaccine

would be ideal for ease of delivery. Since the virus is a member of the flaviviruses it has the unique property of having a structured pre-membrane protein (prM) around the nucleocapsid that contains the ssRNA genome. PrM has been shown to be a target for a protective antibody based immune response. For this reason the prM gene was amplified from viral cDNA and the prM protein expressed and purified from *E. coli* and *Kluyveromyces* systems for use in oral vaccines. For *E. coli* expression, the prM gene was cloned and expression in the pET200 plasmid vector that confers kanamycin resistance and yields a recombinant protein with a hexahistidine fusion suitable for Nickel chelate chromatography. To express prM in yeast, the gene was shuttled into the pKLAC2 plasmid, linearized and transformed into *K. lactis*. Positive transformants were selected based on co-expression of acetamidase that allows utilization of acetamide as the sole nitrogen source. Recombinant proteins expressed in each of these systems will be used to generate an oral vaccine. Two different vehicles have been chosen to administer the protein, a modification of the cholera toxin creating a CTA₂/B chimera and a nanoparticle transport system.

141 *Cx3cl1 Gene Expression in Adipogenic and Osteogenic Induced Bone Marrow Stromal Cells*, **KEMI OYEWOLE^{1*}**, **BELLIN ENRIQUES^{1*}**, **NINI CHAICHANASAKUL²**, **OLGA BEZOUGLAIA²**, **JEANNE NERVINA²**, and **SOTIROS TETRADIS²** (¹Howard Hughes Medical Institute Pre-College Science Education Program, UCLA School of Dentistry, 10833 Le Conte Avenue, 63-007 CHS, Los Angeles, CA 90095; ²UCLA School of Dentistry, 10833 Le Conte Avenue 63-014 CHS, Los Angeles, CA 90095; belline22@yahoo.com, mskemio@aol.com).

Bone marrow stromal cells (BMSCs) are cells with the capability to differentiate into many types of functional cells. **Objective:** To examine gene expression of Cx3cl1, a gene hypothesized to be an indicator of osteoblast differentiation, in adipogenic and osteogenic induced BMSCs. **Methods:** The BMSCs used were harvested from four-week-old Sprague Dawley rats, plated until at least 80% confluent, and then differentiated into adipogenic and osteogenic cells with induction media. Successful induction was demonstrated through staining and gene expression. Oil-Red-O stained lipid droplets in adipogenic cells while Alizarin Red stained mineralized nodules characteristic of osteogenic cells. ALP, an osteogenic stain, was more expressed in osteogenic induced BMSCs. qPCR quantified gene expression in the amplified cDNA extracted from the BMSCs. Osteogenic gene markers (ALP and OCN) were highly expressed in osteogenic induced cells. PPAR γ , an adipogenic gene marker, was expressed significantly more in adipogenic induced cells. **Results:** Cx3cl1 was highly expressed in 7-day osteogenic cells. **Discussion:** Research on bone illness such as osteoporosis may benefit from the results which indicate Cx3cl1 may be an osteogenic marker. In addition, Cx3cl1's interaction with p38 Mitogen Activated Protein Kinase, a factor in the Runx2 transcription and important for osteoblastic differentiation, warrants further

research. **Conclusion:** The high expression of Cx3cl1 in osteogenically induced BMSCs indicates the gene may be regarded as an osteogenic marker.

142 *Cyclic Adenosine Monophosphate and Glucose Regulate Transcription of microRNA-375 via a Protein Kinase A Dependent Pathway*, **ELIZABETH CLARK***, **JAMIE MILLS**, **JUAN ARAUJO-SARINANA***, and **DAVID M. KELLER** (Department of Biological Sciences, California State University Chico, 400 West First St, Chico, CA 95929-515; liz_c@sbcglobal.net).

MicroRNAs are small noncoding RNA molecules 20-22 nucleotides in length which repress translation of specific target messenger RNAs. Dysregulation of microRNAs has been associated with diseases such as cancer and diabetes. *MicroRNA-375* (*miR-375*) is required for proper development of the pancreas and is implicated in maintaining glucose homeostasis, insulin secretion, and beta cell survival. We have observed that increasing concentrations of glucose and cyclic adenosine monophosphate (cAMP) lead to decreased pre-*miR-375* levels in cultured INS-1 beta cells. We are currently investigating the mechanism by which glucose and cAMP regulate *miR-375*. It is possible that the downregulation of *miR-375* is regulated by a protein kinase A (PKA)-dependent pathway. In this model, cAMP increases PKA activity which in turn phosphorylates and activates transcriptional repressors. Currently we are transfecting INS-1 832/13 cells with PKA inhibitor (PKI). PKI-expressing cells are treated with glucose and a cAMP agonist, and the levels of pre-*miR-375* monitored by real time PCR. If glucose and cAMP act through PKA to downregulate *miR-375*, we expect to block the decrease of pre-*miR-375* in PKI transfected cells vs. control. The results of this study could lead to an improvement in type 2 diabetes treatments. Specifically, a current therapy for type 2 diabetes, exendin-4, binds to the glucagon like peptide-1 (GLP-1) receptor to increase cAMP and glucose stimulated insulin secretion. *MiR-375* may be a pivotal member of this pathway. As RNA silencing technology improves, RNA interference could be used to suppress *miR-375* in type 2 diabetics leading to better control of glucose homeostasis.

143 *Creating EF1- α Promoter pTRIPz Vectors to Express Cdk2ap1-shRNAmir in Mouse Embryonic Stem Cells*, **RIGO MARTINEZ¹***, **JAMAL MATTHEWS¹***, **AMIT DESHPANDE²**, **JEFFREY KIM²**, and **DAVID T. WONG²** (¹Howard Hughes Medical Institute Pre-College Science Education Program, UCLA School of Dentistry, 10833 Le Conte Avenue, Los Angeles, CA 90095; ²Dental Research Institute, UCLA School of Dentistry, 10833 Le Conte Avenue, Los Angeles, CA 90095; rrmigomartinez@gmail.com, jmatt212@sbcglobal.net).

Oral cancer is a deleterious disease that if not treated early, can result in death. Various oncogenes (tumor-causing genes) and tumor suppressor genes have been shown to have a dynamic relationship with the development and mitigation of oral cancer. Studies have shown that CDK2API, a tumor suppressor gene, is

down-regulated in about 70% of oral cancers. Our objective is to understand the role of CDK2API in embryonic stem cells (ESC) by down-regulating CDK2API expression. To accomplish this, we designed a plasmid construct for shRNAmir expression that expresses well, and is functional, in mouse ESC (mESC). Preliminary tests showed that the original UBC promoter in the pTRIPz vector had a less efficient expression in mESC compared to the EF1- α promoter. We therefore replaced the UBC promoter in the pTRIPz plasmid with the EF1- α promoter from the pLVHTM vector. Subcloning was analyzed by restriction digestion. We were able to successfully generate the EF1- α promoter pTRIPz vector. Future experiments will use our engineered vector to express the Cdk2ap1-shRNAmir in ESC to induce the knock-down of gene expression. Understanding the normal function of tumor-related genes will not only further our understanding of the function of these genes in tumorigenesis but will also lead to developing novel approaches for cancer therapeutics.

144 *A Novel Method for Interrogating Loss of Function in Apoptosis*, **CHARLES W. MORGAN¹***, **DANIEL C. GRAY¹**, and **JAMES A. WELLS²** (¹Graduate Group in Chemistry and Chemical Biology, ²Departments of Pharmaceutical Chemistry and Cellular and Molecular Pharmacology, University of California, San Francisco, Byers Hall, 1700 4th Street, San Francisco, CA 94158; charles.morgan@ucsf.edu).

Programmed cell death or apoptosis results in the elimination of cells coordinated by a family of cysteine-aspartyl specific proteases called caspases. A subset of caspases, termed executioners, selectively cleave death substrates that result in the profound morphological transformations that are characteristic of apoptotic cells. Employing novel protein engineering and genetic methods we are developing a general technique to study *loss of protein function* as a result of proteolytic processing.

Caspase substrates have been identified and studied extensively by traditional biochemical approaches, but little is known about the role of individual substrates in controlling cell death within a cellular context. Furthermore, traditional apoptotic inducers, e.g. TRAIL and staurosporine, induce caspase-mediated cell death, resulting in a system-wide proteolytic processing by caspases and therefore do not allow for the phenotypic analysis of a single substrate. Our system incorporates a novel retroviral vector to “replace” an endogenous allele with an engineered allele that is susceptible to N1a Tobacco Etch Virus (TEV) site-specific proteolysis and a split-TEV protease under small molecule control.

We are validating the functionality of our system with a classic example of caspase-mediated loss of function, inhibitor of caspase activated DNase (ICAD). ICAD is a mandatory folding chaperone and inhibitor of caspase activated DNase (CAD). Upon liberation from ICAD, CAD dimerizes leading to DNase activation. We demonstrate protein knockdown with single isoform replacement followed by inducible cleavage in several cellular compartments. We are currently investigating the minimal set sufficient to induce DNA laddering.

145 *Delta-Catenin Positively Modulates Gamma-Secretase Function in Alzheimer's Disease*, **LILLIAN F. ZHANG***, **MOCHTAR PRIBADI**, **XIN LIU**, and **HONG WU** (Department of Molecular and Medical Pharmacology, David Geffen School of Medicine, University of California, Los Angeles, 650 Charles E. Young Drive South, Los Angeles, CA 90095; lfzhang@mednet.ucla.edu).

Alzheimer's disease is a progressive neurodegenerative disorder resulting in severe atrophy of the cerebral cortex and cognitive dysfunction. Genetic mutations in the presenilin-1 protein (PS1) result in familial Alzheimer's disease (FAD). PS1 is the active site for the gamma-secretase complex, which cleaves the amyloid precursor protein (APP), and gives rise to amyloid beta peptides. FAD mutations in PS1 increase the ratio of the abnormal amyloid beta-42 peptide (AB42) to the normally produced AB40 peptide by affecting gamma-secretase function. AB42 is more prone to aggregation than AB40 and is the main component of amyloid plaques, one hallmark of Alzheimer's disease. Delta-catenin is a neural specific protein that has been known to interact with PS1. The present study seeks to address whether or not this interaction influences the production of amyloid beta peptides. Our studies suggest that in vivo plaque deposition is considerably amplified in delta-catenin loss-of-function transgenic mice, which exhibit significant cognitive deficits. Furthermore, in vitro studies reveal that delta-catenin appears to effectively modulate gamma-secretase activity. These results indicate that delta-catenin interaction with PS1 may positively alter cleavage of APP by gamma-secretase, thereby decreasing the ratio of AB42 to AB40. Given the importance of this ratio in plaque formation, these results highlight a potential role for delta-catenin in Alzheimer's disease pathogenesis.

146 *The Differences of Mineralization and Differentiation between Regular and Induced Dental Pulp Stem Cells*, **TAYLOR ROBERSON^{1*}**, **MO KANG²**, **JUEUN OH²**, and **SHEBLI MEHRAZARIN²** (¹Howard Hughes Medical Institute Pre-College Science Education Program, UCLA School of Dentistry; ²UCLA School of Dentistry, 10833 Le Conte Avenue 63-014 CHS, Los Angeles, CA 90095; taylorroberson66@yahoo.com).

Dental Pulp Stem Cells (DPSCs) are cells from the tooth that turn into odontoblasts. Odontoblasts are the cells responsible for forming the dentin layer of the tooth. **Objective:** To better understand the mineralization process of the tooth and what effects aging can have on this process. **Methods:** We cultured DPSCs in serial passages using the same control media until they became older and grew at a slower rate and then plated the older DPSCs alongside the young DPSCs to observe their differences. We then checked the levels of Alkaline Phosphatase (ALP) and Dentin Sialoprotein (DSP) as well as Bmi-1 & Notch-1 by running a western blot test and examining the thickness of the fluorescent bands of the antibodies associated with these two markers. **Results:** We found that as the cells matured they began to lose levels of ALP, DSP, Bmi-1, Notch-1, and both their stem cell like properties and ability to differentiate and mineralize.

Conclusion: The high levels of ALP and DSP in induced DPSCs, indicates that these cells have the ability to grow and mineralize more efficiently than those of non-induced DPSCs. **Discussion:** The research conducted with DPSCs could prove to be beneficial to those patients suffering from the various tooth defects that our society faces today.

PSYCHOLOGY

147 *The Effects of Masking on Just Noticeable Differences of Frequency*, **COLTON B. CHRISTIAN** (Department of Psychology, Southern Oregon University, 1250 Siskiyou Boulevard, Ashland, OR 97520; coltonchristian@gmail.com).

This experiment examined the effects of forward masking (FM), backward masking (BM), continuous masking (CM) and absence of masking (UM) on just noticeable differences (JNDs) of sound frequency. JNDs were calculated for 3 normal hearing participants by asking participants which tone they thought was higher pitched: a tone with a masker before (FM), after (BM), or during (CM) the masked tone or the reference tone. The results showed that masking had a statistically significant effect on JNDs of frequency ($p = .005$). Multiple comparisons indicated that both the CM and BM conditions performed poorer than the UM condition. These results comply favorably with past research. Future research could explore the negative correlation established in past research to determine whether statistically significant differences between FM and BM/CM/UM conditions could be calculated.

148 *Olfactory Priming and Self-Perceived Ratings of Empathy*, **COLTON B. CHRISTIAN** and **JEFFREY D. WHITAKER*** (Department of Psychology, Southern Oregon University, 1250 Siskiyou Boulevard, Ashland, OR 97520; coltonchristian@gmail.com).

Past research has examined olfactory priming and activation of areas of the brain related to empathy. More recent studies have examined positive and negative olfactory priming in relation to facial recognition and fMRI activation. The present study is examining self-perceived empathy ratings both with and without an olfactory stimulus comprised of an androstenone containing substance. Participants shall read a script designed to detail a character experiencing a specific emotion. We expect that the resulting ratings of self-perceived empathy (in relation to the character in the story) among the group presented with the olfactory prime will be stronger than the group in which no prime is presented to participants. Overall this study should comply well with past research, as the idea that olfactory stimulation increases the intensity of empathic reactions will be supported.

149 *Evaluative Framing and Escalation of Commitment*, **SAMUEL WALLIS^{1*}** and **CHARLES WALLIS²** (¹Rogers Middle School, 365 Monrovia Avenue Long Beach, CA 90803-1934; ²Department of Philosophy, California State University, Long

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The dollar auction in which multiple players bid on a dollar (Shubik, 1971) initiated escalation of commitment research. The auction winner pays their bid, receiving the dollar; the loser pays their bid, receiving nothing. After the initial commitment of resources to attain some goal (bidding), decision makers must repeatedly choose, under uncertainty, whether to allocate further resources given negative feedback about prior allocations. Often bids exceed values where either player gains from winning. In such cases, the auction *prima facie* drives players to make increasingly irrational decisions (in terms of maximizing utility).

Research suggests escalation of commitment proves ubiquitous and variable in human decision making across a wide range of scenarios. The two psychological theories purport to explain escalation; self-justification theory (Brockner, 1992, Staw & Ross, 1989) and prospect theory (Whyte, 1986). Researchers advocating self-justification hypothesize that agent's escalate commitment to avoid admission of errors in judgment. Prospect theorists adapt Kahneman's and Tversky's (1979) prospect theory, which predicts higher risk aversion when choosing between gains and lower risk aversion when choosing between losses, thereby predicting greatest escalation when options are portrayed as potential losses.

We use an interactive applet to compare these two theories. Subject data indicates loss scenarios result in the highest escalation followed by gain and self-justification scenarios. However, the greatest escalation differentials result between cases framed in non-evaluative terms and all scenarios framed in evaluative terms. Our results suggest that evaluative vs non-evaluative framing swamps the causal power of either self-justification or prospect theory to escalate commitment.

SOCIAL, ECONOMIC, and POLITICAL SCIENCES

150 *Gender of Missing Persons and the Number of Years that They are Reported Missing in Missing-Persons Reports*, **STEPHEN J. MOREWITZ** (California State University, East Bay, Department of Nursing and Health Sciences, 695 Noe St., Ste. 1, San Francisco, CA 94114; morewitz@earthlink.net).

Researchers are evaluating the role of social factors in how long individuals go missing. The gender of missing persons may be an important factor that determines how long they are reported missing. The present investigation is part of the Missing Persons Project. Based on a random sample of 138 missing-persons reports that were filed between 1991 and 2004 and published on the North American Missing Persons Network website, this study tests the null hypothesis that the missing persons' gender is not related to how long they are reported missing. Each missing-person report was coded using a 228-item protocol. The coded data were entered into a data file and Chi-Square

and correlational analysis was then performed using Systat 9 for Windows program (1999). The null hypothesis was rejected. Female missing persons were more likely than male missing persons to be reported missing for more years ($r=+.154$). These results remained statistically significant after controlling for possible intervening factors, such as the missing person's age and racial/ethnic background. These findings indicate that missing females are more likely than missing males to be reported missing for more years. Gender-based role stereotypes and beliefs about the increased susceptibility of females and the greater probability that females are the victims of rape, kidnapping, and other life-threatening crimes, may influence how criminal justice and injury control and emergency health services professionals respond to reports of missing persons.

151 *Age of Missing Persons and the Classification of their Behavior as Unusual in Missing-Persons Reports*, **STEPHEN J. MOREWITZ** (California State University, East Bay, Department of Nursing and Health Sciences, 695 Noe St., Ste. 1, San Francisco, CA 94114; morewitz@earthlink.net).

Individuals may go missing for many reasons. They may be injured, mentally or physically impaired, lost, or the victims of foul play. In other instances, they may go missing because they are the victims of repeated intimate partner violence and are escaping their abusers. In other instances, individuals may go missing in order to create a new life and identity for themselves in a new location. The age of missing persons may be an important factor that determines whether their behavior around the time that they were reported missing is classified as unusual. The present investigation is part of the Missing Persons Project. Based on a random sample of 138 missing-persons reports that were filed between 1991 and 2004 and published on the North American Missing Persons Network website, this study tests the null hypothesis that the missing persons' age is not related to whether their behavior at the time that they were reported missing was categorized as unusual. Each missing-person report was coded using a 228-item protocol. The coded data were entered into a data file and Chi-Square and correlational analysis was then performed using Systat 9 for Windows program (1999). The null hypothesis was rejected. Younger aged missing-persons were more likely than older missing persons to have their behavior classified as unusual ($r=-.128$). These results remained statistically significant after controlling for possible intervening factors, such as the missing person's gender and racial/ethnic background. These findings suggest that younger age individuals who are reported missing are more likely to have their behavior considered as unusual, triggering criminal justice responses than older missing persons. Age-based role stereotypes and beliefs about the increased vulnerability of younger persons and the greater likelihood that younger persons are the victims of rape, kidnapping, and other life-threatening crimes, may influence how criminal justice and injury control and emergency health services professionals respond to reports of missing persons.

AGRICULTURE and HORTICULTURAL SCIENCES

152 *Farming and Seed Conservation Practices Of Rice Farmers in the Marginal Uplands of Lake Sebu, South Cotabato, Philippines*, **FLORENCE LASALITA-ZAPICO***, **TRES TINNA MARTIN**, **RUBY JANE PENA**, and **CATHERINE HAZEL AGUILAR** (Science Department, College of Natural Sciences and Mathematics, Mindanao State University, Fatima, General Santos City; florence.zapico@gmail.com).

This study was undertaken to inventory the upland rice resource base of Lake Sebu, to document the traditional farming and seed conservation practices of the T'bolis and to detect the occurrence of genetic erosion in the farmer's fields. Participatory rural appraisal (PRA) techniques were the methods used in the study. Results revealed very high varietal diversity (136 landraces) of traditional upland rice in the area. Majority of the farmers actively involved in farming were old (61- 80 years old) and had little or no formal education. Seed movement was also unrestricted in the area for most of the sitios. The system of cultivation in the area, however, is done at the subsistence level and is purposely geared towards domestic consumption. Another problem identified was the inaccessibility of most of the sitios resulting into their lack of integration into commercial markets. The introduction of urbanization had also caused a change in lifestyle for the peasant population. The young generation T'boli's specifically have lost interest in the perpetuation of the traditional farming systems as education and urbanization have caused them to depart from their culture and traditions. No effort is also exerted with respect to the conservation of the rice resource and it is made possible through continued utilization. Genetic erosion therefore occurs in farmers' fields and traditional varieties are lost on a continuous basis. Unless mitigating measures are done to save the upland ecosystem, these valuable genetic resources will be irreversibly lost.

153 *Genetic Diversity Analysis of Traditional Upland Rice Cultivars in Kihan, Malapatan, Sarangani Province, Philippines Using Morphometric Markers*, **FLORENCE C. LASALITA-ZAPICO^{1*}**, **JAIME A. NAMOCATCAT¹**, and **JOSEPHINE L. CARIÑO-TURNER²** (¹Science Department, College of Natural Sciences and Mathematics, Mindanao State University, Fatima, General Santos City 9500; ²Indigenous Peoples Development Program, Office of the Provincial Governor, Provincial Capitol, Alabel, Sarangani Province; florence.zapico@gmail.com).

In situ characterization was carried out for thirty two traditional upland rice cultivars in Kihan, Malapatan, Sarangani Province using ten morpho-agronomic characters at the reproductive stage, as a prelude to genetic diversity analysis of the province's traditional rice gene pool. Cluster analysis revealed four groups, each group having a distinct set of morpho-agronomic values. Principal component analysis, which showed two principal components accounting for about 82.7% of total variance observed

also sorted the cultivars into four clusters. Comparison of PCA and dendrogram groupings revealed generally similar trends, though slight inconsistencies were observed in terms of cluster composition. Pearson's correlation analysis of the morphological traits suggests that these traits are significantly and positively correlated with each other except for the flag leaf angle. Though inconclusive due to susceptibility of the evaluated morphological traits to environmental conditions, this study has provided an overall pattern of variation in the upland rice cultivars that can be subjected to more advanced tests involving molecular markers.

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