

***PROCEEDINGS***  
*of the*  
***Annual Meeting***  
*of the*  
***AAAS, PACIFIC DIVISION***

*Volume 28, Part I*

*14 August 2009*

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***SYMPOSIA***

**90<sup>th</sup> Annual Meeting of the Pacific Division of the  
American Association for the Advancement of Science**

*San Francisco State University*  
*and the*  
*California Academy of Sciences*  
*San Francisco, CA*  
*14 – 19 August 2009*

*Contents accurate as of 22 July 2009.*  
*Times and/or locations of events may change.*  
*Please refer to the “Changes” flyer for updated information.*

**A**

Abrahams, Sidney C. ....	8
Ackerman, Josh.....	7
Aldrich, Michele L.....	4
Amemiya, Chris.....	14
Aslan, Susan Massarik.....	10
Athearn, Nicole.....	7

**B**

Baldocchi, Dennis.....	9
Barmina, Olga.....	14
Barnard, Patrick L.....	6
Baross, John.....	15
Barrett, Thomas.....	8
Bartosh, T. J. ....	12
Baye, Peter.....	6
Beck, Sam.....	16
Benedict, Lauryn.....	13
Benner, Steven A.....	15
Bennett, Bill.....	7
Bennett, Byron.....	12
Bernard, George W.....	9
Berry, William B. N. ....	16
Bhushan, Alok.....	12
Boe, Carl.....	13
Bothara, Manish.....	8
Boyer, Katharyn E.....	6, 7
Brown, Cynthia L.....	7
Bunje, Paul M. E.....	11
Burke, Meg.....	16

**C**

Callaway, John C. ....	7
Campbell, Henry J. ....	10
Canuel, Elizabeth A. ....	6
Carey, Charles.....	15
Caruthers, John.....	8
Casazza, Michael.....	7
Chaine, Alexis.....	13
Chang, Andy.....	7
Chasse, Michael.....	9
Chatterjee, Gaurav.....	8
Chianese, Robert L.....	9, 10, 11
Chin, John.....	6
Christie, R. J.....	8
Cleland, Carol E.....	15
Cloern, James.....	7
Cohen, Sarah.....	6, 7, 13
Coleman, Ronald M.....	13
Collins, Josh N.....	6, 7
Collins, Laurel.....	6
Collins, Phillip G.....	7
Cornell, Kenneth A.....	12, 13
Cosentino-Manning, Natalie.....	7
Critser, Greg.....	10
Crow, Karen D.....	14

**D**

Dallas, Kate.....	6
Davies, Paul C. W.....	15
Davis, Jay A.....	6
De La Cruz, Susan.....	7
Demers, Jill.....	7
DeTomaso, Anthony W.....	13
Drexler, Judith Z.....	6
Duffy, Lawrence K.....	11
Dugdale, Richard C.....	6
Dumbacher, John P.....	5

**E**

Eaton, Seron.....	8
Ehinger, Martine O.....	14
Eisen, Michael.....	10
Engelhard, M. H.....	8
Erikson, Li H.....	6

**F**

Flegal, A. Russel.....	7
Fonseca, Mark.....	7
Foxgrover, Amy.....	6
Fram, Jonathan.....	6
Fregoso, Theresa.....	6
Frey, Mark.....	9
Fritzke, Susan L.....	8

**G**

Ganju, Neil.....	6
Garfield, Toby.....	6
Gerlach, S. Craig.....	11
Ghiselin, Michael T.....	4
Gibson, Sally A.....	4
Gilmore, Sara.....	12
Gorman, Kristen.....	15
Gosliner, Terrence.....	6
Grant, B. Rosemary.....	5
Grant, Peter R.....	5
Grenier, Letitia.....	7
Grewell, Brenda.....	7
Grigg, R. David.....	12
Grosberg, Rick.....	13
Groscholz, Edwin.....	7
Gross, Edward.....	6
Grossinger, Robin M.....	6, 7

**H**

Hafernik, John.....	8, 9
Hanes, Dan M.....	6
Harper, Krista.....	11
Harte, John.....	9
Heckman, Paul.....	16
Heggland, Sara J.....	12
Herbert, Sandra.....	4
Higgins, Shawn.....	6
Hodge, Jonathan.....	4
Howson, Becky.....	15

**I**

Impey, Chris.....	15
Ingram, Lynn.....	6

**J**

Jacob, Reed B.....	12
Jaffe, Bruce.....	6
James, Matthew J.....	5
Jiang, W.....	8

**K**

Kabuloglu-Karayusuf, Zeynep G.....	12
Kayani, Asghar.....	8
Kelly, John.....	7
Kevles, Jonathan.....	11
Kimmerer, Wim.....	7
Knapp, Jennifer.....	15
Knowles, Noah.....	6
Kopp, Artyom.....	14
Koteen, Laurie.....	9
Krakauer, Alan H.....	14
Kuchibhatla, S.....	8

**L**

Lai, James C. K.....	12
Largier, John.....	6
Larson, Edward J.....	5
Laskowski, Michele.....	9
Lee, Ronald D.....	13
Leidy, Robert.....	6
Leong, MIsha T.....	9
Leviton, Alan E.....	4
Lindberg, David R.....	14
Lineweaver, Charles E.....	15
Lipps, Jere H.....	4
Loring, Phillip A.....	11
Love, Alan C.....	14
Lucas, Lisa.....	7
Lu, Edward.....	17
Luoma, Sam M.....	6
Lyon, Bruce E.....	13

**M**

Maida, Barbara Yablon.....	9
Maida, Carl A.....	9, 11, 16
Malamud-Roam, Frances.....	7
Malcom, Shirley.....	16
Mancinelli, Rocco L.....	15
Marchi, Al.....	6
Martinez, Tony.....	12
Marvin-DiPasquale, Mark.....	6
Massarik, Fred.....	9
McCosker, John E.....	5
McDougal, Owen M.....	12
McGann, Mary.....	6
McKay, Chris.....	15

McKee, Lester J. ....	6, 7
Meadow, Alison M. ....	11
Medina, Monica ....	14
Merkel, Keith ....	7
Mihram, Danielle ....	10
Mihram, G. Arthur ....	10
Miles, Donald B. ....	13
Miller, Craig T. ....	14
Miller, Donald G. ....	14
Milton, Claire ....	15
Mitchell, Kristen A. ....	12
Modster, Aurielle ....	12
Mohr, Toni. ....	14
Molkentin, Jeffrey D. ....	12
Monismith, Stephen ....	6
Monteiro, Antonia ....	14
Morrison, David ....	17
Mumley, Thomas ....	7

## N

Nachimuthu, P. ....	8
Nagraj, Vinjay J. ....	8
Nandasiri, M. ....	8
Ng, Chen-Siang. ....	14
Nichols, Frederic H. ....	7
Nielsen, Elena ....	6
Nur, Nadav ....	7

## O

O’Gara, Bruce A. ....	12
-----------------------	----

## P

Parker, Alexander E. ....	6
Parker, V. Thomas ....	9
Perlmutter, Michael. ....	7
Pfau, Jean C. ....	12
Photinos, Panos ....	7, 8
Pollak, Tania. ....	8
Porter, Duncan M. ....	4
Powell, Thomas. ....	6
Prasad, Shalini. ....	7, 8

## Q

Quainoo, George ....	8
Qualls, Jeremy S. ....	7, 8
Quapp, Daniel ....	12

## R

Roberts, Richard ....	16
Roque, Rouel S. ....	12
Roselvink, Dano ....	6
Rosenblatt, Richard H. ....	5
Roth, Wolff-Michael ....	11
Roughgarden, Joan. ....	13
Rutherford, Suzannah ....	15

## S

Sachs, Joel L. ....	14
Saha, Nil Ratan ....	14
Sanghavi, Rahul ....	8
Sayles, Marty Rapp. ....	11
Schmandt, Jurgen ....	11
Schoellhamer, David H. ....	6
Schweickart, Rusty ....	17
Scott, Eugenie ....	10
Sedlak, Margaret D. ....	6
Sehdev, Vikas ....	12
Sharma, Prashant. ....	8
Sheffield, Emilyn ....	8
Shelton, Theresa L. ....	9
Shin, Ki-Hyuk ....	12
Shizuka, Daizaburo ....	13
Shutthanadan, V. ....	8
Siem, Ellen ....	7, 8
Simms, Ellen L. ....	14
Sinerevo, Barry ....	13
Smith, Jeramiah. ....	14
Song, Zhiyuan ....	13
Sowers, Janet. ....	6
Specht, Chelsea ....	15
Stacey, Mark ....	6
Strathmann, Richard ....	13
Stringer, Lewis ....	9
Sulloway, Frank J. ....	5
Swalla, Billie J. ....	14

## T

Taberski, Karen ....	7
Takekawa, John Y. ....	7
Tanaka, Kohtaro ....	14
Tanner, Kimberly ....	16
Tarter, Jill ....	15
Thevuthasan, S. ....	8
Thompson, Jan ....	7
Tsutsui, Neil D. ....	14

## U

Ulane, Chris ....	15
-------------------	----

## V

Van Der Wegen, Mick. ....	6
Van Syoc, Robert ....	5
Vavra, Jay ....	11, 16, 17
Vincent, Aimee. ....	9
Vo, Van ....	12

## W

Warnock, Nils. ....	7
Watson, Elizabeth B. ....	7
Werner, Inge ....	7
White, Michael. ....	10
Wiktor, Peter ....	8
Wilkerson, Frances P. ....	6
Wolfe-Simon, Felissa ....	15

Woodrow, Don ....	6
Worden, Simon P. ....	15
Wright, Scott A. ....	6
Wu, Peter. ....	8
Wyllie-Echeverria, Sandy ....	7

## Y

Yearwood, Brad. ....	8
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## Z

Zabin, Chela. ....	7
Zink, Andrew G. ....	13, 14

# 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

**Friday, 14 August 2009**

### *Darwin and the Galapagos, Part I*

California Academy of Sciences

Forum

Friday

9:00 AM – 5:00 PM

Program Organizer: *Michael Ghiselin* (California Academy of Sciences, San Francisco, CA)

Sponsored by the California Academy of Sciences.

This program commemorates the bicentennial of the birth of Charles Darwin and the 150th anniversary of the publication of On the Origin of Species. A collaborative effort between the California Academy of Sciences and the Pacific Division of the American Association for the Advancement of Science (AAAS), this symposium is dedicated to the memory of the late Robert I. Bowman, former Professor of Biology at San Francisco State University, who had a lifelong interest in Galapagos finches. The Academy itself has a long history of involvement in scientific activities in the Galapagos Archipelago. After the destruction of its building in the San Francisco earthquake and fire of 1906, the collections from the Galapagos expedition of 1905 – 1906 were crucial to the reestablishment of its facilities. The Academy has the best collection of Galapagos materials in the world.

Session chair: *Michael T. Ghiselin*

**9:00** *Welcoming statements*

**9:30 6** *Robert Irwin Bowman (1925-2006) Remembered*, **ALAN E. LEVITON and MICHELE L. ALDRICH** (California Academy of Sciences, San Francisco, CA).

**10:00 7** *Charles Darwin: Besides Galapagos*, **JERE H. LIPPS** (Department of Integrative Biology and Museum of Paleontology, University of California, Berkeley, CA).

**10:45 BREAK**

**11:15 8** *Recreating Darwin's Experiences as a Geologist Using Texts, Sites, and Specimens*, **SANDRA HERBERT** (Department of History, University of Maryland Baltimore County, Baltimore, MD).

**12:00 9** *Tracing Darwin's Geological Footsteps on Isla Santiago (James Island)*, **SALLY A. GIBSON** (Department of Earth Sciences, University of Cambridge, UK).

**12:45 LUNCH**

**2:15 10** *Darwin, the Galapagos and His Changing Thoughts about Species Origins: 1835-37*, **JONATHAN HODGE** (History and Philosophy of Science, Department of Philosophy, University of Leeds, UK).

**3:00 BREAK**

**3:30 11** *Going Public on the Galapagos: Reading Darwin between the Lines*, **MICHAEL T. GHISELIN** (Department of Invertebrate Zoology, California Academy of Sciences, San Francisco, CA).

**4:15 12** *Darwin: The Botanist on the Beagle*, **DUNCAN M. PORTER** (Department of Biological Sciences, Virginia Polytechnic Institute and State University, Blacksburg, VA).

Note: This symposium continues on Saturday, 15 August. Please refer to page 5 for the Saturday schedule.

**Saturday, 15 August 2009**

***Darwin and the Galapagos, Part II***

California Academy of Sciences

Forum

Saturday

9:00 AM – 5:00 PM

Program continues from page 4.

Session Chair: *Michael T. Ghiselin*

**9:00 13** *A Damned Creation: The Galapagos Before Darwin*, **EDWARD J. LARSON** (Humanities Division, Pepperdine University, Malibu, CA).

**9:45 14** *Collecting Evolution: The Untold Story of the Vindication of Charles Darwin by the 1905-06 Galapagos Expedition of the California Academy of Sciences*, **MATTHEW J. JAMES** (Department of Geology, Sonoma State University, Rohnert Park, CA).

**10:30 BREAK**

**11:00 15** *Darwin, Barnacles and the Galapagos: A View through a 21<sup>st</sup> Century Lens*, **ROBERT VAN SYOC** (Department of Invertebrate Zoology and Geology, California Academy of Sciences, San Francisco, CA).

**11:45 16** *The Fishes of the Galápagos Archipelago*, **JOHN E. McCOSKER<sup>1\*</sup> and RICHARD H. ROSENBLATT<sup>2</sup>** (<sup>1</sup>California Academy of Sciences, San Francisco, CA; <sup>2</sup>Scripps Institution of Oceanography, University of California San Diego, La Jolla, CA).

**12:30 LUNCH**

**2:00 17** *Collecting Galapagos and the Pacific: How Rollo Howard Beck Shaped Our Understanding of Evolution*, **JOHN P. DUMBACHER** (Department of Ornithology and Mammalogy, California Academy of Sciences, San Francisco, CA).

**2:45 18** *The Evolution of Darwin's Finches*, **PETER R. GRANT and B. ROSEMARY GRANT** (Department of Zoology, Princeton University, Princeton, NJ).

**3:30 BREAK**

**3:45 19** *Darwin and the Galápagos: What Darwin Would Like to Have Known*, **FRANK J. SULLOWAY** (Institute of Personality and Social Research, University of California, Berkeley, CA).

**4:30** *Discussion and Closing*

**Monday, 17 August 2009**

***San Francisco Bay: Tracking and Understanding a Changing Estuary***

SCIENCE 201

Monday

8:25 AM – 6:00 PM

Program organizers: *John Largier* (Bodega Marine Laboratory, University of California, Davis, CA), *Sarah Cohen* and *Kathy Boyer* (Romberg Tiburon Center, San Francisco State University, San Francisco, CA), and *Terrence Gosliner* (California Academy of Sciences, San Francisco, CA).

Sponsored by the Pacific Division Section on Ecology, Organismal Biology and Environmental Sciences.

San Francisco Bay is changing – owing to the multiple influences of watershed changes, changing human use of the Bay, climate change, and management priorities. With attention to evolving issues, this symposium features invited presentations on changing biophysical systems in the Bay and the research science that has led to new understanding of these changes. It builds on previous AAAS symposia and the volumes edited by Hollibaugh (1996) and Conomos (1979), with a focus on the Bay proper, i.e., west of Carquinez Strait.

Session chair: *John Largier*

**8:25** *Introductions, Context, and Welcome*

**8:30** **20** *Climate Change From Both Ends: Projected Sea Level Rise and Inflow Changes in San Francisco Bay*, **NOAH KNOWLES** (U.S. Geological Survey, Menlo Park, CA; ).

**8:55** **21** *Morphological Change of the San Francisco Estuary*, **BRUCE JAFFE**<sup>1\*</sup>, **THERESA FREGOSO**<sup>1</sup>, **AMY FOXGROVER**<sup>2</sup>, **MICK VAN DER WEGEN**<sup>3</sup>, **DANO ROELVINK**<sup>3</sup>, **NEIL GANJU**<sup>4</sup>, **KATE DALLAS**<sup>5</sup>, **PATRICK BARNARD**<sup>1</sup>, **DAN HANES**<sup>1</sup>, **JOHN CHIN**<sup>6</sup>, **DON WOODROW**<sup>6</sup>, **MARY McGANN**<sup>6</sup>, **LYNN INGRAM**<sup>7</sup>, **SHAWN HIGGINS**<sup>8</sup>, **MARK MARVIN-DIPASQUALE**<sup>6</sup> and **ELENA NIELSEN**<sup>9</sup> (<sup>1</sup>United States Geological Survey, Pacific Science Center, Santa Cruz, CA; <sup>2</sup>Virginia Institute of Marine Science, Gloucester Point, VA; <sup>3</sup>UNESCO-IHE, 2601 DA Delft, The Netherlands; <sup>4</sup>United States Geological Survey, Woods Hole Science Center, Woods Hole, MA; <sup>5</sup>University of California Santa Cruz, Santa Cruz, CA; <sup>6</sup>United States Geological Survey, Menlo Park, CA; <sup>7</sup>University of California Berkeley, Berkeley, CA; <sup>8</sup>Kamman Hydrology and Engineering, Inc., San Rafael, CA; <sup>9</sup>United States Geological Survey, Portland, OR).

**9:20** **22** *A New Regime of Decreased Sediment and Carbon Supply in the San Francisco Estuary*, **DAVID H. SCHOELLHAMER**<sup>1\*</sup>, **SCOTT A. WRIGHT**<sup>1</sup>, **ELIZABETH A. CANUEL**<sup>2</sup>, **JUDITH Z. DREXLER**<sup>1</sup>, and **LESTER J. McKEE**<sup>3</sup> (<sup>1</sup>U.S. Geological Survey, Sacramento, CA; <sup>2</sup>Virginia Institute of Marine Science, Gloucester Point, VA; <sup>3</sup>San Francisco Estuary Institute, Oakland, CA).

**9:45** **23** *Historical Landscapes of the San Francisco Bay Area: New Perspectives on the Past and the Future*, **ROBIN GROSSINGER**<sup>1\*</sup>, **JOSH COLLINS**<sup>1</sup>, **LESTER McKEE**<sup>1</sup>, **PETER BAYE**<sup>2</sup>, **LAUREL COLLINS**<sup>3</sup>, **ROBERT LEIDY**<sup>4</sup>, and **JANET SOWERS**<sup>5</sup> (<sup>1</sup>San Francisco Estuary Institute, Oakland, CA; <sup>2</sup>Annapolis, CA; <sup>3</sup>Watershed Sciences, Berkeley, CA; <sup>4</sup>Wetlands Regulatory Office, U.S. Environmental Protection Agency, San Francisco, CA; <sup>5</sup>William Lettis and Associates, Walnut Creek, CA).

**10:10 BREAK**

**10:30** **24** *Central San Francisco Bay: The Circulation Crossroads of San Francisco Bay*, **MARK STACEY**<sup>1\*</sup>, **JOHN LARGIER**<sup>2</sup>, **TOBY GARFIELD**<sup>3</sup>, **STEPHEN MONISMITH**<sup>4</sup>, **THOMAS POWELL**<sup>1</sup>, **JONATHAN FRAM**<sup>5</sup>, and **EDWARD GROSS**<sup>4,6</sup> (<sup>1</sup>University of California Berkeley; <sup>2</sup>University of California Davis (Bodega Marine Lab); <sup>3</sup>Romberg Tiburon Center, San Francisco State University; <sup>4</sup>Stanford University; <sup>5</sup>University of California Santa Barbara; <sup>6</sup>Bay Modeling).

**10:55** **25** *Historical and Present-Day Bathymetric Changes and Sediment Transport Patterns in and around the Golden Gate*, **PATRICK L. BARNARD**<sup>1\*</sup>, **DAN M. HANES**<sup>1</sup>, **LI H. ERIKSON**<sup>1</sup>, **BRUCE JAFFE**<sup>1</sup> and **KATE DALLAS**<sup>2</sup> (<sup>1</sup>United States Geological Survey, Pacific Science Center, Santa Cruz, CA; <sup>2</sup>University of California Santa Cruz, Department of Earth and Planetary Sciences, Santa Cruz, CA).

**11:20** **26** *Primary Production in the Northern San Francisco Estuary: Recent Insights From Carbon and Nitrogen Productivity Studies*, **ALEXANDER E. PARKER**<sup>\*</sup>, **RICHARD C. DUGDALE**, **FRANCES P. WILKERSON** and **AL MARCHI** (Romberg Tiburon Center, San Francisco State University, Tiburon, CA).

**11:45** **27** *Contaminants in San Francisco Bay: Current Status and Advances in Science and Management Over the Past 15 Years*, **JAY A. DAVIS**<sup>1\*</sup>, **LESTER J. McKEE**<sup>1</sup>, **MARGARET D. SEDLAK**<sup>1</sup>, **SAM**

**N. LUOMA<sup>2</sup>, A. RUSSEL FLEGAL<sup>3</sup>, CYNTHIA L. BROWN<sup>4</sup>, THOMAS MUMLEY<sup>5</sup>, KAREN TABERSKI<sup>5</sup> and INGE WERNER<sup>6</sup>** (<sup>1</sup>San Francisco Estuary Institute, Oakland, CA; <sup>2</sup>John Muir Institute of the Environment, University of California Davis, Davis, CA; <sup>3</sup>University of California Santa Cruz, Santa Cruz, CA; <sup>4</sup>US Geological Survey, Menlo Park, CA; <sup>5</sup>San Francisco Bay Regional Water Quality Control Board, Oakland, CA; <sup>6</sup>University of California Davis, Davis, CA).

**12:10 LUNCH**

**1:30 28** *Temporal and Spatial Distributions of Benthic and Pelagic Grazers: How Do They Affect Phytoplankton Dynamics in San Francisco Bay?* **JAN THOMPSON<sup>1\*</sup>, LISA LUCAS<sup>1</sup> and WIM KIMMERER<sup>2</sup>** (<sup>1</sup>United States Geological Survey, Menlo Park, CA; <sup>2</sup>Romberg Tiburon Center, San Francisco State University, Tiburon, CA).

**1:55 29** *Climate Shift, Crabs, Shrimp, Fish and Phytoplankton in San Francisco Bay*, **JAMES CLOERN** (USGS, Menlo Park, CA).

**2:20 30** *Restoration of Eelgrass (Zostera marina) Habitats in San Francisco Bay: A Rapidly Evolving Understanding of Limitations and Opportunities*, **KATHARYN E. BOYER<sup>1</sup>, SANDY WYLLIE-ECHEVERRIA<sup>2</sup>, SARAH COHEN<sup>1</sup>, KEITH MERKEL<sup>3</sup>, NATALIE COSENTINO-MANNING<sup>4</sup>, and MARK FONSECA<sup>5</sup>** (<sup>1</sup>Romberg Tiburon Center, San Francisco State University, Tiburon, CA; <sup>2</sup>Friday Harbor Laboratories, University of Washington, Friday Harbor, WA; <sup>3</sup>Merkel and Associates, San Diego, CA; <sup>4</sup>NOAA Fisheries Restoration Center, Santa Rosa, CA; <sup>5</sup>National Ocean Service/NOAA, Beaufort, NC).

**2:45 31** *New Perspectives on the Wetlands of San Francisco Bay: Their Past, Present, and Future Relationships to the Bay and Its Watersheds*, **JOSH N. COLLINS<sup>1\*</sup>, LETITIA GRENIER<sup>1</sup>, ROBIN M. GROSSINGER<sup>1</sup>, LESTER J. McKEE<sup>1</sup>, JOHN CALLAWAY<sup>2</sup>, FRANCES MALAMUD-ROAM<sup>3</sup>, and ELIZABETH B. WATSON<sup>4</sup>** (<sup>1</sup>San Francisco Estuary Institute, Oakland, CA; <sup>2</sup>University of San Francisco, San Francisco, CA; <sup>3</sup>California Department of Transportation, Oakland, CA; <sup>4</sup>El Centro de Investigación Científica y de Educación Superior, Ensenada, B.C. México).

**3:10 BREAK**

**3:30 32** *Trends of Waterbird Populations in San Francisco Bay: Top-Down Assessment of Ecosystem Health*,

**JOHN Y. TAKEKAWA<sup>1\*</sup>, SUSAN DE LA CRUZ<sup>1</sup>, NICOLE ATHEARN<sup>1</sup>, MICHAEL CASAZZA<sup>1</sup>, JOSH ACKERMAN<sup>1</sup>, JILL DEMERS<sup>2</sup>, JOHN KELLY<sup>3</sup>, NADAV NUR<sup>4</sup>, NILS WARNOCK<sup>5</sup>, MICHAEL PERLMUTTER<sup>6</sup>, and ROBIN GROSSINGER<sup>7</sup>** (<sup>1</sup>USGS Western Ecological Research Center, Sacramento, CA; <sup>2</sup>San Francisco Bay Bird Observatory, Milpitas, CA; <sup>3</sup>Audubon Canyon Ranch, Marshall, CA; <sup>4</sup>PRBO Conservation Science, Petaluma, CA; <sup>5</sup>University of California Wildlife Health Center, Davis, CA; <sup>6</sup>Audubon Society; <sup>7</sup>San Francisco Estuary Institute, San Francisco, CA).

**3:55 33** *Cascading Threats, Constrained Management and the Future of Invasive Species in San Francisco Bay*, **EDWIN GROSHOLZ<sup>1\*</sup>, CHELA ZABIN<sup>1</sup>, ANDY CHANG<sup>1</sup>, BILL BENNETT<sup>2</sup> and BRENDA GREWELL<sup>3</sup>** (<sup>1</sup>Department of Environmental Science and Policy, University of California, Davis, CA; <sup>2</sup>Center for Watershed Sciences, University of California, Davis, CA; <sup>3</sup>USDA Agricultural Research Service, Davis, CA).

**4:20 34** *Screening of the 1974 PBS NOVA Film, “Inside the Golden Gate,” with Introduction and Follow-up Discussion*, **FREDERIC H. NICHOLS** (U. S. Geological Survey, Menlo Park, CA, retired).

**4:30** *Video: 1974 PBS NOVA “Inside the Golden Gate”*

**5:20** *General Discussion*

***Materials Science and  
Materials Science Education***

HENSILL HALL 439

Monday

8:55 AM – 12:00 PM

Program organizers: *Panos Photinos* and *Ellen Siem* (Department of Physics and Engineering, Southern Oregon University, Ashland, OR), *Phillip G. Collins* (Department of Physics and Astronomy, University of California, Irvine, CA), *Shalini Prasad* (Department of Electrical and Computer Engineering, Portland State University, Portland, OR), and *Jeremy Qualls* (Department of Physics and Astronomy, Sonoma State University, Rohnert Park, CA).

Sponsored by the Pacific Division Sections on Physics and Materials Science, and Science and Technology Education

**Materials Science**

Session Chairs: *Panos Photinos* and *Jeremy Qualls*

**8:55** *Welcome and Announcements*

**9:00 35** *Nanomonitors: Electrical Immunoassays for Protein Biomarker Profiling*, **SHALINI PRASAD**<sup>1,2</sup>, **MANISH BOTHARA**<sup>1</sup>, **THOMAS BARRETT**<sup>3</sup> and **JOHN CARRUTHERS**<sup>4</sup> (<sup>1</sup>Department of Electrical and Computer Engineering, Portland State University, Portland, OR; <sup>2</sup> Department Electrical Engineering, Arizona State University, Tempe, AZ; <sup>3</sup>Department of Medicine, Oregon Health Sciences University, Portland, OR; <sup>4</sup>Department of Physics, Portland State University, Portland).

**9:20 36** *Nanomonitor Technology for Glycosylation Analysis*, **GAURAV CHATTERJEE**<sup>1\*</sup>, **VINAY J. NAGRAJ**<sup>2</sup>, **PETER WIKTOR**<sup>2</sup>, **SERON EATON**<sup>2</sup> and **SHALINI PRASAD**<sup>1</sup>, (<sup>1</sup>Department of Electrical Engineering, Arizona State University, Tempe, AZ; <sup>2</sup>Center for Bioelectronics and Biosensors, The Biodesign Institute at Arizona State University, Tempe, AZ).

**9:40 37** *Low Dimensional Boundary States*, **JEREMY S. QUALLS** and **BRAD YEARWOOD** (Department of Physics and Astronomy, Sonoma State University, Rohnert Park, CA).

**10:00 BREAK**

**10:20 38** *Thickness Dependence of Thin Film Samaria Doped Ceria Oxygen Sensor*, **RAHUL SANGHAVI**<sup>1</sup>, **M. NANDASIRI**<sup>2,3</sup>, **S. KUCHIHATLA**<sup>2</sup>, **P. NACHIMUTHU**<sup>2</sup>, **M.H. ENGELHARD**<sup>2</sup>, **V. SHUTTHANANDAN**<sup>2</sup>, **W. JIANG**<sup>2</sup>, **S. THEVUTHASAN**<sup>2</sup>, **ASGHAR KAYANI**<sup>3</sup>, and **S. PRASAD**<sup>1</sup> (<sup>1</sup>Department of Electrical Engineering, Arizona State University, Tempe, AZ; <sup>2</sup>EMSL, Pacific Northwest National Laboratory, Richland, WA; <sup>3</sup>Physics Department, Western Michigan University, Kalamazoo, MI).

**10:40 39** *Phase Transitions and Ferroelectricity in  $\text{NaSb}_3\text{F}_{10}$* , **R. J. CHRISTIE**, **P. WU**, **P. PHOTINOS** and **S. C. ABRAHAMS** (Department of Chemistry, Physics, Materials and Engineering, Southern Oregon University, Ashland, OR).

**Materials Science Education**

Session Chair: *Shalini Prasad*

**11:00 40** *Introducing Nanophysics and Nanotechnology at the Undergraduate Level: Physics Majors and Non-Science Majors*, **ELLEN SIEM** (Department of Chemistry, Physics, Materials and Engineering, Southern Oregon University, Ashland, OR).

**11:20 41** *Conceptual Approach to Teaching Nanoscience to Undergraduates*, **PRASHANT SHARMA** (Department of Physics, Suffolk University, Boston, MA).

**11:40 42** *The First Undergraduate Materials Science Degree in Oregon*, **GEORGE QUAINOO** and **ELLEN SIEM** (Department of Chemistry, Physics, Materials and Engineering, Southern Oregon University, Ashland, OR).

***Conservation in an Urban National Park***

HENSILL HALL 543

Monday

9:00 AM – 4:30 PM

Program Organizers: *Tania Pollak* (Presidio Trust, San Francisco, CA) and *John Hafernik* (Department of Biology, San Francisco State University, San Francisco, CA).

Sponsored by the Pacific Division section on Ecology, Cell Biology and Environmental Sciences

Encompassing 80,000 acres and adjacent to cities containing 1.7 million people, the Golden Gate National Recreation Area (GGNRA) is one of the world's largest urban national parks. The GGNRA is also nationally and internationally renowned for its beauty and recreational opportunities. These parklands support historic resources alongside valuable ecological resources, including 33 federally listed rare plant and animal species. This proximity to urban communities, and high visitor use, provide both challenges for protection of park resources and opportunities to engage the public in conservation, monitoring and restoration of those resources.

This symposium focuses on this urban national park's challenges and opportunities, its recognition that resources cannot be conserved without the community's participation, and its efforts to inspire that community to move from park user to park volunteer. The symposium also addresses the park's efforts at sustainability related to resource conservation and park management.

Session Chair: *Tania Pollak*

**9:00** *Introductory Comments*

**9:05 43** *The Evolving People and Landscapes of the West*, **EMILYN SHEFFIELD** (Department of Recreation and Parks Management, California State University Chico, Chico, CA).

**9:35 44** *Ecological Restoration in National Parks: Case Examples from Golden Gate National Recreation Area*, **SUSAN L. FRITZKE** (National Park Service, Golden Gate National Recreation Area, Natural Resources and Science, Fort Mason, San Francisco, CA).

**10:05 45** *Restoration of Remediation Sites*, **MARK FREY<sup>1</sup>** and **LEWIS STRINGER<sup>2</sup>** (<sup>1</sup>Presidio Trust, San Francisco, CA; <sup>2</sup>National Park Service, Fort Mason, San Francisco, CA).

**10:35 BREAK**

**11:00 46** *Rare Plants and Citizen Science in the GGNRA*, **MICHAEL CHASSE** (National Park Service, Golden Gate National Recreation Area, Natural Resources and Science, San Francisco, CA).

**11:30 47** *Conserving and Managing Extremely Rare Species: The Presidio Manzanita (*Arctostaphylos montana* subsp. *ravenii*)*, **V. THOMAS PARKER** (Department of Biology, San Francisco State University, San Francisco, CA).

**12:00 LUNCH**

**1:00 48** *Species Invasion in California Ecosystems: Linking Changes in Plant Composition to Changes in Local and Global Climate*, **LAURIE KOTEEN<sup>1\*</sup>**, **JOHN HARTE<sup>1,2</sup>** and **DENNIS BALDOCCHI<sup>2</sup>** (<sup>1</sup>Energy and Resources Group, University of California, Berkeley, CA; <sup>2</sup>Department of Environmental Science, Policy and Management, University of California, Berkeley, CA).

**1:30 49** *Bees, Beetles, and Spiders: Species Assemblage Patterns Within the San Francisco Presidio*, **MISHA T. LEONG<sup>1\*</sup>** and **JOHN HAFERNIK<sup>2</sup>** (<sup>1</sup>Department of Environmental Science, Policy and Management, University of California, Berkeley, CA; <sup>2</sup>Department of Biology, San Francisco State University, San Francisco, CA).

**2:00 50** *Assessment of a Stream Restoration Project Using Benthic Macroinvertebrates in an Urban Park*, **THERESA L. SHELTON\*** and **JOHN HAFERNIK** (Department of Biology, San Francisco State University, San Francisco, CA).

**2:30 BREAK**

**3:00 51** *Sustainable Nursery Practices*, **MICHELE LASKOWSKI** (Golden Gate National Parks Conservancy, Presidio Restoration Nursery, Fort Mason, San Francisco, CA).

**3:30 52** *Sustainable Approaches to Park Management*, **AIMEE VINCENT** (Operations Department, Presidio Trust, San Francisco, CA).

**4:00 Discussion**

***New Humanities and Science Convergences:  
Darwin and Culture***

HENSILL HALL 667

Monday

1:15 PM – 5:00 PM

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

Sponsored by the Pacific Division General and Interdisciplinary Section.

This symposium explores the influence of Darwinian ideas that extend beyond biology into all branches of culture—from ecology, anthropology, economics, sociology and law, to such areas as art, literature, and design. Just how influential has evolution become in various academic disciplines, and how does it serve as a theoretical basis or even a metaphor for contemporary culture in its many forms today?

Does society evolve in Darwinian fashion, or is this just a metaphor to characterize change itself? Some speak of economies evolving in various stages as if it were a living species; does the analogy have some basis in biological fact? How can any one writer's or artist's or thinker's work be said to evolve? Is contemporary architecture an evolutionary outgrowth of previous forms or a simple shift of design, materials and function? How much does the idea of sustainability, as it applies to cultural matters, resemble the sustainability of natural systems?

Session Chair: *Robert L. Chianese*

**1:15** *Welcome and Introductory Comments*

**1:25 53** *Not Everything Is Darwin: Evolution and Archival Change Theory in Light of Field-Theoretic Thought*, **FRED MASSARIK** (University of California Los Angeles, Anderson Graduate School of Management, Los Angeles, CA).

**1:50 54** *Darwin's Orchids: Cross-Pollination from Two or Three Perspectives*, **BARBARA YABLON MAIDA** (University of California Los Angeles, Department of Geography, Los Angeles CA).

**2:15 55** *How the Mouth Evolved into an Organ of Love*, **GEORGE W. BERNARD** (Departments of Oral Biology, Medicine and Neurobiology, UCLA Schools of Dentistry and Medicine, Los Angeles, CA).

**2:40 56** *Community as Experience: Dewey, Darwin, and Aesthetic Ecology*, **CARL A. MAIDA** (University of California, Center for the Health Sciences, Los Angeles, CA).

3:05 BREAK

3:20 **57** *Victorian Poets Adapt to Darwin*, **ROBERT LOUIS CHIANESE** (California State University Northridge, Department of English, Northridge CA).

3:45 **58** *Darwin: C.P. Snow and Also Fundamentalism*, **G. ARTHUR MIHRAM<sup>1</sup> and DANIELLE MIHRAM<sup>2</sup>** (<sup>1</sup>Princeton, NJ; <sup>2</sup>University Libraries and Department of French and Italian, University of Southern California, Los Angeles, CA).

4:10 **59** *Educating for the Future: The Need for an Evolutionary Process in Teaching and Learning*, **SUSAN MASSARIK ASLAN** (Los Angeles Unified School District, Somis, CA).

4:35 *Discussion of the Presentations*

***Good Science is Only Part of the Job:  
Communicating Science to the Public***

HENSILL HALL 113

Monday

1:30 PM – 4:50 PM

Program organizer: *Henry J. Campbell* (Ion Publications, Folsom, CA)

Sponsored by the Pacific Division General and Interdisciplinary Section.

As science has become a larger part of the cultural landscape, researchers have frequently found themselves navigating the difficult waters of policies and politics. It has become increasingly necessary for scientists to work with the media to insure accurate portrayals of science issues so there can be better understanding by the public and therefore better decisions by policy makers. Each of the presentations will address how scientists can be better equipped to manage different media when sharing research and information with the public.

Section Chair: *Henry J. Campbell*

1:30 *Introductory Comments:*

1:35 **60** *Interacting with Science Journalists*, **GREG CRITSER** (Pasadena, CA).

2:05 **61** *Journals? We Don't Need No Stinking Journals*, **MICHAEL EISEN** (Department of Molecular and Cell Biology, and Genomics Division of the Lawrence Berkeley National Lab, University of California, Berkeley, CA).

3:05 BREAK

3:20 **62** *Blazing Your Own Trail: Writing Directly to the Public*, **MICHAEL WHITE** (Department of Genetics and Center for Genome Sciences, Washington University School of Medicine, Washington University, St. Louis, MO).

3:50 **63** *Constructive Debates When Science and Politics Mix*, **EUGENIE SCOTT** (National Center for Science Education, Oakland, CA).

**Tuesday, 18 August 2009**

***Sustainability as a Way of Life:  
Learning, Practice, and Experience***

California Academy of Sciences

Forum

Tuesday

8:30 AM – 5:00 PM

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

Program sponsored by the Pacific Division General and Interdisciplinary Section.

The ongoing process of achieving sustainable systems is transforming many areas of modern life and culture: housing, building and community design, agriculture, energy use and transportation, waste management, forestry, business and economics, as well as personal life style, community values, and social relationships. This symposium examines sustainability as it impacts and transforms our daily lives. We will explore a wide range of topics and questions, including:

- Does sustainability represent a new paradigm for personal, community, and global cooperation, or is its impact limited to a few areas of economics and the environment?
- As we move further in the twenty-first century up the path toward more sustainable living, just how will our lives be changed?
- How have the arts, architecture, and design been influenced by sustainability in both their content and methods of production?
- What do plans for making sustainability a part of study across the curriculum mean for education and its goals?
- What are the implications for shifting our attention from “maximums” to “optimums” as social ideals?
- How might competitiveness as a goal be affected?
- Are we being asked, perhaps impossibly, to shift or abandon some basic and valuable elements of our humanness in the pursuit of more efficient and sustainable ways of living?
- How is personal consciousness shaped by having to take into account the global consequences of everyday living decisions?
- Will intimate relationships and love itself be transformed by sustainable practices?
- Does dedication to sustainable living involve a new ethic?

**8:30** *Welcome, Introductions and Brief Remarks by AAAS Pacific and Arctic Division Executive Directors Roger G. Christianson and Lawrence Duffy* **CARLA. MAIDA** (UCLA Schools of Medicine and Dentistry, University of California Los Angeles, Los Angeles, CA).

**8:45** *Overview of the Symposium and Framing of the Topic: Does Economic Crisis Lead to a More Sustainable Way of Life?* **ROBERT L. CHIANESE** (Department of English, California State University, Northridge, CA).

**9:00** **64** *Sustainability: How the Idea Evolved and Where It Will Lead Us,* **JURGEN SCHMANDT** (Houston

Advanced Research Center and University of Texas, Austin, TX).

**9:30** **65** *Mainstreaming Sustainability: The Opportunity Presented by Climate Change,* **PAUL M. E. BUNJE** (Institute of the Environment, University of California Los Angeles, Los Angeles, CA).

**10:00 BREAK**

**10:15** **66** *Evaluating and Designing Urban Food Systems: The Role of Local Initiatives,* **ALISON M. MEADOW** (Department of Anthropology, University of Alaska Fairbanks, Fairbanks AK).

**10:45** **67** *Coming to Terms with Northern Foods, Northern Futures,* **S. CRAIG GERLACH, LAWRENCE K. DUFFY and PHILLIP A. LORING** (Department of Anthropology, University of Alaska, Fairbanks, AK).

**11:15** **68** *Ecologies of Hope: Cross-Cultural Perspectives on Sustainability and Social Justice,* **KRISTA HARPER** (Department of Anthropology and the Center for Public Policy and Administration, University of Massachusetts, Amherst, MA).

**11:45 LUNCH**

**1:45** **69** *Going Green in Cartoon Sitcoms,* **MARTY RAPP SAYLES** (Department of English, California State University Northridge, Northridge, CA).

**2:15** **70** *Chiropractic for Sustainability – Aligning Ourselves, Our Business Systems, and Our Change Initiatives for Lasting and Intended Impacts,* **JONATHAN KEVLES** (Clean Energy Solutions Campaign, Sierra Club, San Francisco, CA).

**2:45** **71** *The San Diego Bay Study: Community-Based Conservation,* **JAY VAVRA** (High Tech High, San Diego, CA).

**3:15 BREAK**

**3:30** **72** *An Arctic Dimension of Sustainability: Resource Development, Legacies, and Education,* **LAWRENCE K. DUFFY** (Department of Chemistry and Biochemistry, University of Alaska Fairbanks, Fairbanks, AK).

**4:00** **73** *Bootstrapping into Resilience: Science Education as/for Sustainability,* **WOLFF-MICHAEL ROTH** (University of Victoria, Victoria, BC).

**4:30** *Discussion of the Presentations*

***Recent Advances in  
Pharmacology and Toxicology***

HENSILL HALL 113

Tuesday

8:40 AM – 4:15 PM

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

Program sponsored by the Pacific Division sections in Cell and Molecular Biology, and Chemistry and Biochemistry.

The development of novel therapeutic strategies requires a detailed understanding of mechanisms that regulate homeostasis, along with an appreciation of the delicate balance that exists between the pharmacological and toxicological effects of chemical compounds. This session will focus on recent advances in understanding the pharmacological and toxicological effects of drugs, chemicals and environmental contaminants. Investigators are invited to present research on the identification of targets for new drug development, new drug screening strategies, and novel mechanisms of drug action. Emphasis will also be placed on the identification of mechanisms of toxicity for drugs, chemicals and environmental contaminants, as well as novel approaches to toxicity testing.

Session Chairs: *Kristen Mitchell and Kenneth Cornell*

**8:40** *Welcome and Introductions*

**8:45** **74** *Biochemical Analysis of Parasitic Protozoan Methylthioadenosine Nucleosidases as a Target for Antibiotic Therapies*, **DANIELL QUAPP\*** and **KENNETH A. CORNELL** (Department of Chemistry and Biochemistry, Boise State University, Boise, ID 83725; danielquapp@u.boisestate.edu).

**9:15** **75** *Evaluation of MTA/SAH Nucleosidase Inhibitors as *B. burgdorferi* Antibiotics and Biofilm Suppressors*, **TONY MARTINEZ\*** and **KENNETH A. CORNELL** (Department of Chemistry and Biochemistry, Boise State University, Boise, ID 83725; tonymartinez@u.boisestate.edu).

**9:45** **76** *The Tumor Suppressor p53 Regulates DNA End Joining Activity in Normal Human Oral Keratinocytes*, **AURIELLE MODSTER\*** and **KI-HYUK SHIN** (University of California Los Angeles School of Dentistry, 10833 Le Conte Ave., Los Angeles, CA 90095; aurielle.modster@gmail.com).

**10:15 BREAK**

**10:30** **77** *Finding MRSA's Kryptonite: Computational Directed Combatant Pentapeptides*, **REED B. JACOB\***, **KENNETH A. CORNELL**, and **OWEN**

**M. McDOUGAL** (Department of Chemistry and Biochemistry, Boise State University, ID 83725; greengi-ant99@gmail.com).

**11:00** **78** *Worms, Brains, and Copper – A Recipe for Neural Damage*, **BRUCE A. O'GARA** (Department of Biological Sciences, Humboldt State University, Arcata, CA 95521; Bruce.OGara@humboldt.edu).

**11:30** **79** *The Impact of Environmental Toxins on Bone Health: Mechanisms of Cadmium-induced Osteotoxicity*, **SARA J. HEGGLAND** (Department of Biology, The College of Idaho, Caldwell, ID 83605; shegglan@collegeofidaho.edu).

**12:00 LUNCH**

**1:30** **80** *Asbestos Autotoxicus: Inhalation Toxicology and Pathogenic Autoantibodies*, **JEAN C. PFAU** (Department of Biological Sciences, Idaho State University, Pocatello, ID 83209; pfaujean@isu.edu).

**2:00** **81** *In Vivo Regulation of Hepatocyte Proliferation by the Aryl Hydrocarbon Receptor*, **KRISTEN A. MITCHELL** (Department of Biological Sciences, Boise State University, Boise, ID 83725; kristen-mitchell@boisestate.edu).

**2:30** **82** *Retinoic Acid Induces Cardiac Stem Cell Differentiation Via Activation of L-type Calcium Channels and Calcium Signaling*, **ROUELS S. ROQUE<sup>1,2\*</sup>**, **T.J. BARTOSH<sup>2</sup>**, and **JEFFERY D. MOLKENTIN<sup>3</sup>** (<sup>1</sup>Department of Basic Sciences, Touro University Nevada, Henderson, NV 89014; <sup>2</sup>Department of Cell Biology and Genetics, University of North Texas HSC, Fort Worth, TX 76107; and <sup>3</sup>Department of Molecular Cardiovascular Biology, Cincinnati Childrens Hospital Medical Center, Cincinnati, OH 45229; rouel.roque@tun.touro.edu).

**3:00 BREAK**

**3:15** **83** *Pt(II) Complexes of 4,4'-disubstituted-2,2'-bipyridine: Structure and Cytotoxicity*, **BYRON BENNETT<sup>1</sup>**, **R. DAVID GRIGG<sup>1</sup>**, **VAN VO<sup>3</sup>**, **ZEYNEP G. KABULUGLU-KARAYUSUF<sup>3</sup>**, **VIKAS SEHDEV<sup>2</sup>**, **SARA GILMORE<sup>2</sup>**, **JAMES C.K. LAP<sup>2</sup>**, and **ALOK BHUSHAN<sup>2</sup>** (<sup>1</sup>Department of Chemistry, Idaho State University, 921 South 8<sup>th</sup> Ave., Stop 8023, Pocatello, ID 83209-8023; <sup>2</sup>Department of Biomedical and Pharmaceutical Sciences, College of Pharmacy, and ISU Biomedical Research Institute, Idaho State University, 921 S. 8<sup>th</sup> Ave., Pocatello, ID 83209; <sup>3</sup>Chemistry Department, University of Nevada

Las Vegas, 4505 Maryland Parkway, Las Vegas, Nevada 89154; bennbyro@isu.edu).

- 3:45 84** *Pharmacologic Targeting of Bacterial Cell “Phones”*: Can You Hear Me Now? **KENNETH A. CORNELL** (Department of Chemistry and Biochemistry, Boise State University, Boise, ID 83725; kencornell@boisestate.edu).

### ***The Evolution of Cooperation: Theoretical and Experimental Approaches***

SCIENCE 101  
Tuesday  
9:00 AM – 5:00 PM

Program organizer: Andrew G. Zink (Department of Biology, San Francisco State University, San Francisco, CA)

Program sponsored by the Pacific Division Ecology, Organismal Biology and Environmental Sciences Section.

Explaining cooperative associations remains one of the greatest challenges of evolutionary biology. This symposium highlights theoretical and empirical approaches to understanding the evolution of cooperation at two distinct levels of organization: individuals within populations and species within communities. Recent reviews have highlighted the need for theoretical integration of these two areas of research and this symposium is an important step toward that goal. The program is organized into four main areas: 1) cooperation between mated pairs, 2) cooperation between parents and their offspring, 3) cooperation among individuals in large animal societies, and 4) cooperation between symbiotic species. Specific topics addressed within each of these four areas are intentionally broad in order to facilitate discussions and an exchange of ideas across different levels of biology. The impressive range of study organisms reveals both the breadth of the field and the great potential for novel collaborations among researchers that work on the evolution of cooperation.

Session Chair: *Andrew G. Zink*

#### **Mating Systems**

- 9:00** *Introductory Remarks*, **ANDREW G. ZINK**
- 9:20 85** *Cooperation and Conflict in a Biparental Cichlid Fish*, **RONALD M. COLEMAN** (Department of Biological Sciences, California State University, Sacramento, CA).
- 9:40 86** *Vocal Duets Facilitate Cooperation Between Mates*, **LAURYN BENEDICT** (Museum of Vertebrate Zoology and Department of Integrative Biology, University of California, Berkeley, CA).

- 10:00 87** *The Evolution of Greenbeard Cooperation and Mating System Transitions in Vertebrates*, **BARRY SINERVO<sup>1</sup>**, **ALEXIS CHAINE<sup>2</sup>** and **DONALD B. MILES<sup>3</sup>** (<sup>1</sup>Department of Ecology and Evolutionary Biology, University of California, Santa Cruz, CA; <sup>2</sup>Station d'Ecologie Expérimentale du CNRS à Moulis, Saint-Girons, France; <sup>3</sup>Department of Biological Sciences, Ohio University, Athens, OH).

#### **10:20 BREAK**

#### **Parents and Offspring**

- 10:40 88** *Demographic Aspects of the Evolution of Sociality: Food Sharing in the Family and Beyond*, **RONALD D. LEE** and **CARL BOE** (Department of Demography, University of California, Berkeley, CA).
- 11:00 89** *Cooperation and Conflict Over Reproductive Skew among Parents and their Offspring*, **ANDREW G. ZINK** (Department of Biology, San Francisco State University, San Francisco, CA).
- 11:20 90** *Incentives in Animal Teams: Implications for Parental-Investment Theory*, **JOAN ROUGHGARDEN** and **ZHIYUAN SONG** (Department of Biology, Stanford University).
- 11:40 91** *Two Conflicts Make a Cooperation?: Parental Aggression and Favoritism within Families*, **DAIZABURO SHIZUKA** and **BRUCE E. LYON** (Ecology and Evolutionary Biology, University of California Santa Cruz, Santa Cruz, CA).

#### **12:00 LUNCH**

#### **Societies**

- 1:20 92** *The Evolution of Multicellularity: A Minor Major Transition?* **RICK GROSBURG<sup>1</sup>** and **RICHARD STRATHMANN<sup>2</sup>** (<sup>1</sup>Center for Population Biology, University of California, Davis, CA; <sup>2</sup>Friday Harbor Laboratories, University of Washington, Seattle, WA).
- 1:40 93** *Germline Chimerism and Stem Cell Parasitism in the Colonial Ascidian, *Botryllus schlosseri**, **ANTHONY W. DE TOMASO** (Department of MCD Biology, University of California, Santa Barbara, CA).
- 2:00 94** *Environmental Variation in Allorecognition Behavior in Colonial Marine Invertebrates*, **SARAH COHEN** (Department of Biology, San Francisco State University, San Francisco, CA).

**2:20 95** *The Mechanisms Underlying Individual Behaviors and Sociality of Ants*, **NEIL D. TSUTSUI** (Department of Environmental Science, Policy and Management, University of California Berkeley, Berkeley, CA).

**2:40 96** *Exploring an Opportunity for Selection Approach for Indirect Fitness Benefits*, **ALAN H. KRAKAUER** (Department of Evolution and Ecology, University of California, Davis, CA).

**3:00 BREAK**

**Symbioses**

**3:20 97** *The Role of Dispersal in the Exploitation of Communal Galling*, **DONALD G. MILLER** (Department of Biological Sciences, California State University Chico, Chico, CA).

**3:40 98** *The Origins and Evolution of Uncooperative Symbionts*, **JOEL L. SACHS** (Department of Biology, University of California, Riverside, CA).

**4:00 99** *Fitness Trade-offs in a Horizontally Transmitted Mutualism: Legumes and Rhizobia*, **ELLEN L. SIMMS<sup>1</sup>**, **MARTINE O. EHINGER<sup>1</sup>**, **TONI MOHR<sup>1</sup>**, and **JOEL L. SACHS<sup>1,2</sup>** (<sup>1</sup>Department of Integrative Biology, University of California, Berkeley, CA; <sup>2</sup>Department of Biology, University of California, Riverside, CA).

**4:20 100** *Genomics of Coral-Algal Symbiosis*, **MONICA MEDINA** (School of Natural Sciences, University of California Merced, Merced, CA).

**4:40 Concluding Remarks**, **ANDREW G. ZINK**

***Evolutionary Innovations: Where Ecology, Development and Macroevolution Intersect***

HENSILL HALL 543

Tuesday

9:00 AM – 4:20 PM

Program organized by *Karen Crow-Sanchez* (Department of Biology, San Francisco State University, San Francisco, CA)

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

The origin of evolutionary novelties is central to evolutionary developmental biology. Underlying factors associated with innovation include exploitation of existing genetic pathways in new ways via gene duplication, acquisition of new regulatory elements, and

mutations in protein coding sequences. Driving factors and potential constraints include ecological opportunity and evolvability.

Session Chair: *Karen Crow*

**9:00 Welcome and Announcements**

**9:10 101** *How Genomics Is Reshaping Our Ideas About Evolution*, **CHRIS T. AMEMIYA\***, **NIL RATAN SAHA**, and **JERAMIAH SMITH** (Benaroya Research Institute at Virginia Mason, Seattle, WA).

**9:40 102** *Origin, Evolution and Variations of the Chordate Body Plan*, **BILLIE J. SWALLA** (Department of Biology and Friday Harbor Laboratories, University of Washington, Seattle, WA).

**10:10 BREAK**

**10:30 103** *Duplicate Hox Genes in Ray-finned Fishes and Their Role in the Evolution of Novelty and Diversity*, **KAREN D. CROW** (Department of Biology, San Francisco State University, San Francisco, CA).

**11:00 104** *Genetic Analysis of Loss and Gain Traits in Three-spine Sticklebacks*, **CRAIG T. MILLER** (Department of Molecular and Cell Biology, Berkeley, CA).

**11:30 105** *Evolutionary Innovations and Multidisciplinary Explanation in Biology: Prospects and Problems*, **ALAN C. LOVE** (Department of Philosophy, Minnesota Center for Philosophy of Science, University of Minnesota, Minneapolis, MN).

**12:00 LUNCH**

**1:30 106** *The Role of Integration, Intersections and Trees in Providing Insights into Evolutionary Innovations of Snails and Whales*, **DAVID R. LINDBERG** (Department Of Integrative Biology and Museum of Paleontology, University of California, Berkeley, CA).

**2:00 107** *The Origin and Diversification of *Drosophila* Sex Combs*, **ARTYOM KOPP\***, **OLGA BARMINA**, **KOHTARO TANAKA**, and **CHEN-SIANG NG** (Section of Evolution and Ecology, University of California Davis, Davis, CA).

**2:30 108** *The Origin, Function, and Diversification of Eyespot Patterns in Butterflies*, **ANTONIA MONTEIRO** (Department of Ecology and Evolutionary Biology, Yale University, New Haven, CT).

**3:00 BREAK**

**3:20 109** *Innovations and Novel Structures: The Evolution of the Stamen Whorl in Tropical Gingers (Zingiberales)*, **CHELSEA SPECHT** (Department of Plant and Microbial Biology, University of California Berkeley, Berkeley, CA).

**3:50 110** *Hsp90 and Evolvability: Opportunity or Constraint?* **SUZANNAH RUTHERFORD, CHARLES CAREY, KRISTEN GORMAN, BECKY HOWSMON, CLAIRE MILTON, CHRIS ULANE, and JENNIFER KNAPP** (Division of Basic Science, Fred Hutchinson Cancer Research Center, Seattle, WA).

### *Weird Life*

HENSILL HALL 206

Tuesday

1:30 PM – 5:00 PM

Program organizer: *Jill Tarter* (Center for SETI Research, SETI Institute, Mountain View, CA).

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

During 2009, Charles Darwin and his contribution to our understanding of the connectedness of all life on Earth (as we know it) will be celebrated numerous times. But what about life as we don't yet know it? In 2007 the National Academy of Sciences released a report on of what it called 'Weird Life', life with an alternate biochemistry, life that may not share a common ancestor with all life that we are familiar with today. How would we recognize life based on different biosolvents, different nucleotides, different metabolic pathways? What instruments should we develop to aid human and robotic explorers undertaking a search for other forms of life? Are there extremophiles of the truly weird variety awaiting discovery on Earth, if only we knew how to identify them? These questions are all germane to the young discipline of Astrobiology as it seeks to understand the origins and extent of life here on Earth, and the potential for life beyond Earth.

Session chair: *Jill Tarter*

**1:30 111** *What Is Weird Life — Why Should We Care?* **JOHN BAROSS** (University of Washington, School of Oceanography, Seattle, WA).

**1:40 112** *Life on Earth, Part II*, **CHRIS MCKAY<sup>1</sup>, PAUL C. W. DAVIES<sup>2</sup>, STEVEN A. BENNER<sup>3</sup>, CAROL E. CLELAND<sup>4</sup>, CHARLES E. LINEWEAVER<sup>5</sup> and FELISSA WOLFE-SIMON<sup>6</sup>** (<sup>1</sup>NASA Ames Research Center, Moffett Field, CA; <sup>2</sup>Beyond Center for Fundamental Concepts in Science, Arizona State University, Tempe AZ; <sup>3</sup>Foundation for Applied and Molecular Evolution, Gainesville FL; <sup>4</sup>Department

of Philosophy, University of Colorado, Boulder CO; <sup>5</sup>Planetary Science Institute Research School of Astronomy and Astrophysics, Weston Creek, Australia; <sup>6</sup>Department of Earth and Planetary Sciences, Harvard University, Cambridge, MA).

**2:10 113** *Extremophiles We Already Know and Love: What Do They Suggest?* **ROCCO L. MANCINELLI** (Carl Sagan Center for the Search for Life in the Universe, SETI Institute, Mountain View, CA).

**2:40 114** *Using New Space Agency Technologies to Search for Weird Life*, **SIMON P. WORDEN** (NASA Ames Research Center, Moffett Field, CA).

**3:10 BREAK**

**3:30 115** *How Strange Can Life Be?* **CHRIS IMPEY** (University of Arizona, Department of Astronomy, Tucson, AZ).

**4:00 116** *Distant Biosignatures: Life on Exoplanets*, **JOHN BAROSS** (University of Washington, School of Oceanography, Seattle, WA).

**4:30 117** *Searching for Weird Life of the Intelligent Kind*, **JILL TARTER** (Center for SETI Research, SETI Institute, Mountain View CA).

**Wednesday, 19 August 2009**

***Project-Based Learning and the Culture of  
Science Education in the 21<sup>st</sup> Century***

HENSILL HALL 206

Wednesday

8:30 AM – 1:00 PM

Program organizers: *Carl Maida* (University of California, Los Angeles, CA) and *Paul Heckman* (University of California, Davis, CA).

Sponsored by the Pacific Division section on Science and Technology Education.

This session will combine didactic, experiential, and reflective activities – essential elements in Project-Based Learning – to engage audience members and presenters in a *professional learning community* experience. The intent is to provide an opportunity for collaborative inquiry and the learning related to it. Project-Based Learning builds on John Dewey’s work on experiential, hands-on, student-directed learning, a century ago. According to the Buck Institute for Education, Project-Based Learning is “a systematic teaching method that engages students in learning knowledge and skills through an extended inquiry process structured upon complex, authentic questions and carefully designed products and tasks.” Although the various learning settings and Project-Based Learning projects may resemble each other in terms of their organizational arrangements, the learning is ultimately delivered within a student-teacher relationship. The structure of this relationship and that of the school itself were shaped by an industrial culture that developed during a period of rapid industrialization in the late nineteenth century when the dual revolutions of technology and information processing were transforming the United States. For just as the technological and economic innovations of the Second Industrial Revolution rationalized production and distribution techniques in the material economy, the contemporary “control revolution” has provided new modes of information processing and communication technology to transform the cognitive or symbolic direction of twenty-first century enterprises. During the earlier transition from craft to mass production, schools provided a social context for the task of renegotiating and reframing both occupational techniques and world orientations in light of dramatic technological changes. So, too, have the challenges of the current technological revolution shifted the emphasis of education toward students actively using what they know to explore, negotiate, interpret and create. Project-Based Learning challenges students by acknowledging their roles as participants engaged in producing knowledge. Through an amalgam of knowledge, skills, teamwork, and communication, Project-Based Learning helps to develop habits of mind associated with personal and occupational success in the global economy. Like that of any complex service organization, school culture includes both the quality of interpersonal relations and the informal norms governing various activities, specifically help and trust. This session will examine the quality and nature of the student-teacher relationship in Project-Based Learning, specifically in science education. Learning encounters can be conceived as dialogues, and a distinctive feature of Project-Based Learning is that this relationship is constructed and negotiated through such encounters. Students perceive the value of Project-Based Learning, experience this form of learning, and are rewarded through the responses of

others (including parents, siblings and peers) to their projects through learning encounters. Of particular interest is the nature of the relationship for both the student and the teacher in this process.

Session Chairs: *Carl Maida* and *Paul Heckman*

**8:30** *Welcome and Introductions*

**8:45** *Introductory Remarks: The Promise of Project-Based Learning for Science Teachers and their Students*, **SHIRLEY MALCOM** (Education and Human Resources Directorate, American Association for the Advancement of Science).

**9:15** *Styles of Project-Based Learning*

Moderator:

**PAUL HECKMAN** (Professor and Associate Dean, School of Education, University of California, Davis, CA)

Panelists:

**WILLIAM B. N. BERRY** (Professor, Department of Earth and Planetary Science, University of California, Berkeley, CA).

**MEG BURKE** (Director of Education, California Academy of Sciences, San Francisco, CA).

**JAY VAVRA** (Biology Teacher and Director, Biotechnology Program, High Tech High, San Diego, CA).

**10:00 BREAK**

**10:15** *Designing and Planning a Successful Project: From Ideas to Action*

Breakout Sessions with Panelists

**11:30** *Reflections on Project-Based Learning in 21<sup>st</sup> Century Science Education*

Moderator:

**CARL MAIDA** (Professor and Co-Director, UCLA-Howard Hughes Medical Institute Pre-College Science Education Initiative, University of California, Los Angeles, CA).

Panelists:

**SAM BECK** (Director, Urban Semester in New York City, College of Human Ecology, Cornell University, Ithica, NY).

**RICHARD ROBERTS** (Beyond the Bell Branch (retired), Los Angeles Unified School District, Los Angeles, CA).

**KIMBERLY TANNER** (Professor and Director, Science Education Partnership and Assessment Laboratory, San Francisco State University, San Francisco, CA).

**12:15** Film: *Students of Consequence: African Bushmeat Expedition*, produced by the Students of Gary and

Jerri-Ann Jacobs High Tech High, San Diego, CA. Introduction by *Jay Vavra* (High Tech High, San Diego, CA). Note: this film will be shown in SCIENCE 201.

***Near Earth Objects:  
A Threat and Response Update***

HENSILL HALL 543

*Wednesday*

8:30 AM – 12:00 PM

Program organized by *Rusty Scheiweckart* (former astronaut [lunar module pilot for Apollo 9 and backup commander for first Skylab mission], currently Chairman, Association of Space Explorers Near Earth Object [ASE-NEO] Committee, Sonoma, CA).

Sponsored by the Pacific Division sections on Earth Sciences; Ecology, Organismal and Environmental Sciences; and Physics and Materials Sciences.

Near-Earth objects (NEOs), the cohort of asteroids and comets whose orbits cross that of the Earth, comprise the bullets in the cosmic shooting gallery within which the Earth circulates. While the cosmic environment is essentially constant our knowledge of the specific objects populating the neighborhood within which we orbit the Sun is growing dramatically. We know statistically that there are over a million of these objects which, if they impact Earth, can do serious harm to life on the planet. While today we have discovered and actively track only 0.2% of these objects, the number of such known and cataloged objects will grow to about 40% over the next 10-15 years.

The result of this rapid increase in knowledge will necessitate a response on the part of the international community. We have the technology today to divert over 95% of these potential impact threats given sufficient warning. This capability has not, however, been demonstrated nor are there current commitments to do so.

In the end the technology challenges associated with early warning and deflection may pale in comparison with the international geopolitical challenge of making a coordinated decision of whether or not to respond to a perceived impact threat. Since eliminating the threat of an impact necessarily requires a temporary shifting of impact risk between peoples and nations, the decision to act (or not to act) presents an unprecedented international challenge.

These elements of a societal NEO impact threat response system will each be discussed and summarized.

Session Chair: *Rusty Schweickart*

**8:30** *Welcome and Announcements*

**8:35** **118** *The NEO Environment: What We Know and What's Coming*, **DAVID MORRISON** (Director, NASA Lunar Science Institute, and Senior Scientist, NASA Astrobiology Institute, NASA Ames Research Center, Moffett Field, CA).

**9:10** **119** *NEO Deflection; An Overview and Some Perspective*, **RUSTY SCHWEICKART** (Chairman, B612 Foundation, Sonoma, CA and Chairman, Near Earth Objects (NEO) Committee, Association of Space Explorers (ASE), Houston, TX).

**9:45** **BREAK**

**10:10** **120** *Know Then Tow: The Role of Transponder - Gravity Tractor Spacecraft in Asteroid Deflection Campaigns*, **EDWARD LU** (Google, Inc., Mountain View, CA and B612 Foundation, Sonoma, CA).

**10:45** **121** *The Geopolitics of NEO Deflection and Mitigation*, **RUSTY SCHWEICKART** (Chairman, B612 Foundation, Sonoma, CA and Chairman, Near Earth Objects (NEO) Committee, Association of Space Explorers (ASE), Houston, TX).

**11:20** *Panel Discussion*