

**PROCEEDINGS of the
AMERICAN ASSOCIATION or the ADVANCEMENT OF SCIENCE
PACIFIC DIVISION**

Volume 25, Part I

June 18, 2006

**87th ANNUAL MEETING of the AAAS PACIFIC DIVISION
PROGRAM WITH ABSTRACTS**



**UNIVERSITY of SAN DIEGO
San Diego, CA
June 18 – 22, 2006**



University of San Diego



ADVANCING SCIENCE. SERVING SOCIETY

PROCEEDINGS
of the
Annual Meeting
of the
AAAS, PACIFIC DIVISION

Volume 25, Part I

June 18, 2006

PROGRAM with ABSTRACTS

*87th Annual Meeting of the Pacific Division of the
American Association for the Advancement of Science*

**University of San Diego
San Diego, CA
June 18 – 22, 2006**

*Contents accurate as of June 1, 2006.
Times and/or locations of events may change.
Please refer to the Day-At-A-Glance for the most up-to-date information.*



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Publication

Publication of symposia or other technical sessions or talks that have been prepared under the auspices of the AAAS, Pacific Division requires written permission of the AAAS, Pacific Division as well as that of the individual organizers and speakers.

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Abstracts and summaries published in this Proceedings reflect entirely the individual views of the authors and not necessarily that of the AAAS, Pacific Division, its Council, Executive Committee or its officers. Presentation of ideas, products or publications at this AAAS, Pacific Division meeting or the reporting of them in news accounts does not constitute endorsement by the AAAS, Pacific Division.

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 16 of this Proceedings.

Planning Committee for the 87th**Annual Meeting**

Chair: Anne M. Sturz, Marine Science and Environmental Studies, USD

Co-Chair: Kathleen M. Fisher, Center for Research in Mathematics and Science Education, and Biology, SDSU

General Planning Support: Lisa Baird, Biology, USD
Tammy Dwyer, Chemistry and Biochemistry, USD

Greg Severn, Department of Physics, USD
Program Development: Elizabeth Baker, Marine Science and Environmental Studies, USD

Robert L. Chianese, English, CSU Northridge

Alana Cordy-Collins, Anthropology, USD
David De Haan, Chemistry, USD

David Devine, Physics, USD

Tori Heflin, Anthropology, USD

Kathleen M. Fisher, CRMSE and Biology, SDSU

Veronica Galván, Psychology, USD

Sarah Gray, Marine Science and Environmental Studies, USD

Frank Jacobitz, Engineering, USD

Thomas Kretzschmar, Geology, CICESE

Mary Sue Lowery, Biology, USD

Carl A. Maida, Dentistry and Medicine, UCLA

Suzanne Michel, Marine Science and Environmental Studies, USD

Marjory Patrick, Biology, USD

Panos Photinos, Physics and Engineering, SOU

Leigh Plesniak, Chemistry and Biochemistry, USD

Daniel Sheehan, Physics, USD

Debbie Tahmassebi, Chemistry and Biochemistry, USD

Annette Taylor, Psychology, USD

Kathy S. Williams, Biology, SDSU

Alberto Zirino, Marine Science and Environmental Studies, USD

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President-elect: Carl A. Maida, University of California, Los Angeles, Los Angeles, CA 90095

Past President: Lynn M. Dudley, Utah State University, Logan, UT 84322.

Executive Director: Roger G. Christianson, Southern Oregon University, Ashland, OR 97520

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Roger G. Christianson, Southern Oregon University, Ashland, OR 97520

Lynn M. Dudley, Utah State University, Logan, UT 84322

Kathleen M. Fisher, San Diego State University, San Diego, CA 92120

Walter Carl Hartwig, Touro University College of Osteopathic Medicine, Mare Island, CA 94592

Richard T. Koenig, Washington State University, Pullman, WA 99164

Matthew J. La Force, San Francisco State University, San Francisco, CA 94132

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Ann Michelle Wood, University of Oregon, Eugene, Or 97403



June 18, 2006

On behalf of the American Association for the Advancement of Science Pacific Division Council, Executive Committee and officers, and the University of San Diego science faculty, welcome to the 2006 Annual Meeting!

During the next five days, you will have the opportunity to probe the depths of ground-breaking scientific research and explore the many recreational and cultural amenities in and around San Diego.

From the opening workshops on Saturday to Thursday's final field trip exploring natural history and environmental issues in the Anza Borrego Desert and the Salton Sea, you will embark upon a very unique educational experience. You have the chance to participate in dozens of well-planned academic events on campus and enjoy field trips in one of the most stunning natural classrooms in the country that will stimulate and inspire.

On behalf of our science faculty and the entire University of San Diego community, welcome to the 87th annual meeting of the AAAS Pacific Division. We hope you enjoy your visit to America's Finest City.

Sincerely,

A handwritten signature in black ink that reads "Mary E. Lyons".

Mary E. Lyons, President
University of San Diego





Shiley Center for Science and Technology

USD Photographic Services

**ANNUAL MEETING of the AAAS, PACIFIC DIVISION
and its AFFILIATED SOCIETIES and SECTIONS at the
UNIVERSITY of SAN DIEGO
SAN DIEGO, CA
June 18 – 22, 2006**

GENERAL INFORMATION

**SECTIONS SPONSORING SESSIONS
at the SAN DIEGO MEETING**

The following Pacific Division sections are sponsoring sessions at the 87th Annual Meeting of the AAAS, Pacific Division.

Agriculture and Horticultural Sciences
Anthropology and Archaeology
Atmospheric and Oceanographic Sciences
Biological Sciences
Chemistry
Computer and Information Sciences
Earth Sciences
Ecology and Environmental Science
Education
Engineering and Industrial Sciences
Health Sciences
History and Philosophy of Science
Physics
Psychology
Social, Economic and Political Sciences

**UNIVERSITY of SAN DIEGO
and SAN DIEGO**

The University of San Diego (USD) is a Roman Catholic institution of higher learning. Presently enrolling more than 7,500 students, it is known for its commitment to teaching, the liberal arts and the formation of values and community service. The university adds depth to education by inspiring students to grow spiritually, morally and socially.

USD's 180-acre campus, Alcalá Park, sits atop a mesa overlooking San Diego's Mission Bay and the Pacific Ocean. The university campus is a community treasure, with Spanish Renaissance inspired buildings and breathtakingly beautiful landscapes, including the spot where Father Junipero Serra celebrated the first Catholic Mass in Alta California more than 230 years ago. Like California's oldest city, the university took its name from San Diego de Alcalá, a Franciscan brother from Alcalá de Henares, a monastery near Madrid, Spain. The Spanish Renaissance architecture that characterizes Spain's five-century-old University of Alcalá serves as the inspiration for all buildings on the USD campus.

Under the leadership of Mother Rosalie Hill of the Society of the Sacred Heart and Bishop Charles Francis Buddy

of the Diocese of San Diego, the University of San Diego began as separate colleges for men and women. Chartered in 1949, the first classes met in 1952 and the School of Law opened its doors in 1954. By the late 1960s it became clear that both colleges would benefit from combining academic resources. In 1972 the University of San Diego became a single coeducational university.

Now governed by a board of trustees independent from the founding organizations, USD welcomes students, faculty and staff of diverse religious traditions and remains dedicated to the values originally articulated by Mother Hill and Bishop Buddy.

SAN DIEGO

With a near-perfect climate, 70 miles of beaches, and mountains and deserts just a short drive away, San Diego draws more than 26 million visitors each year. Known for its countless year-round outdoor activities, San Diego is packed with unique pursuits in the water, on the trails and in the sky. The University of San Diego is just minutes from sailing, windsurfing, kayaking and a host of other water sports. All of the city's beaches are ideal for surfing, body boarding, snorkeling or simply enjoying the sand warmed by the ever-present sun.

Hundreds of miles of trails and parks wind throughout San Diego County, ranging from oceanfront land to mountain pine forests, making it very easy to backpack, hike, camp or rock climb in a variety of elevations and environments. The Pacific Crest Trail, which works its way through 150 miles of San Diego backcountry in its trek from Mexico to Canada, is designated one of America's National Scenic Trails.

San Diego has many attractions, including the world-famous San Diego Zoo and Wild Animal Park. Additionally, the 131-year-old Balboa Park is a 1,200-acre oasis in the heart of the city, complete with 15 museums, eight gardens and the acclaimed Old Globe Theatre. San Diego is also home to one of only three Olympic training centers in the nation. And its coastal waters offer an exceptional seasonal experience: a first-rate vantage point from which to witness the annual migration of gray whales from Alaskan seas to Mexican lagoons.

USD STUDENTS

Though the beach is nearby, USD is a serious academic institution. And while the campus itself is stunning, the people truly make the difference. More than 7,000 candidates vie for 1,000 freshman openings each year. The median incoming freshman holds a 3.72 GPA and an 1180 SAT score, yet each student is unique and selected on expressions of diversity, leadership, service, talent, and essential human character.

Of great significance to USD students are small class sizes; great, accessible faculty; and fantastic lab facilities. Students choose from more than 60 undergraduate and graduate degree programs in academic divisions, including

the College of Arts and Sciences and the schools of Business Administration, Leadership and Education Sciences, Law, and Nursing and Health Science. Plans are underway to inaugurate the new School of Peace Studies in 2007.

NATURAL SCIENCES at USD

The natural sciences at USD include four departments: Biology, Chemistry, Physics, and Marine Science and Environmental Studies. Curricula in the sciences are centered on the belief that students learn best when theoretical concepts are combined with hands-on experience. Students in the sciences take numerous lab and field courses, which provide opportunities to learn useful techniques and participate in the scientific process. Many students carry out research and perform internships that complement their formal course work. Interdisciplinary collaborations are common among faculty and students in different departments.

These interactions are enhanced by the inclusion of all four science departments in the new Donald P. Shiley Center for Science and Technology, which opened in 2003. The Center contains classrooms, offices, and modern labs that are used for teaching as well as faculty and student research. It is equipped with state-of-the-art instrumentation and equipment, including 500 MHz and 400 MHz nuclear magnetic resonance systems, a high pressure liquid chromatography – mass spectrometer, gas chromatography – mass spectrometry instruments, atomic analyzers, a nutrient analyzer, a bomb calorimeter, and a laser particle sorter. Microscopic resources include, among the usual assortment of compound and dissecting microscopes, scanning and transmitting electron microscopes and an atomic force microscope.

Several facilities were constructed for specialized functions, including a seawater system with two 2,000 gallon tanks, environmental chambers, aquarium room, a laser laboratory, and a greenhouse with five rooms with independent climate controls. Research and teaching collections include terrestrial and marine vertebrates, marine invertebrates, insects and an herbarium. A 16-foot research vessel is available for marine science investigations.

REGISTRATION

The Registration Center is in the Rotunda of the Joan B. Kroc Institute for Peace and Justice (IPJ) on the University of San Diego campus. Hours for registration are:

Sunday, 2:00 – 5:00 p.m.

Monday, 7:30 a.m. – 5:00 p.m.

Tuesday, 7:30 a.m. – 4:30 p.m.

Wednesday, 8:00 a.m. – 3:00 p.m.

About field trips: Advance registration was required for all field trips because of limited seating in the vehicles and the need to inform some destinations of the number of people arriving. However, space may be available on some of the excursions. If you are interested in one or more trips, inquire at the Registration Desk to see if space is still available.

Please remember that at least one member of a family group requesting a field trip must be a paid meeting registrant.

About workshops: All workshops are available to paid meeting registrants at no additional charge. In order to ensure adequate space for attendees, we asked those planning to attend the pre-meeting education workshop, “Teaching Scientific Literacy and Critical Thinking Across Disciplines: Hands-On Workshops for Teachers of High School, Community College and University Students,” (see page 17) or any of the Bio-Rad molecular biology workshops (see page 18) to preregister. If you are interested in attending one or more of these workshops please inquire at the Registration Desk to determine if there is still space available. For those coming to attend the Saturday education workshop but not the rest of the meeting, there is a \$20 workshop-only registration fee for teachers 9 – 14 and graduate students intending to teach at the 9 – 14 level. There is a \$30 workshop-only registration fee for all others. For those coming to attend the Bio-Rad workshops but not the meeting, there is a \$20 workshop-only fee.

ACCOMMODATIONS and FOOD SERVICE

Residence Halls: The University of San Diego is offering housing for meeting registrants in their newest residence hall, Manchester Village at a cost of \$52.00 per person per night double or \$67.00 per night single. This price includes breakfast each morning in the dining hall in the Hahn University Center (about a ten minute walk from Manchester or ride the free shuttle). **Hours for breakfast are 7:00 a.m. to 8:30 a.m.**

Manchester Village opened just three years ago. It consists of four bedroom, two bathroom apartments. Two bedrooms and a bathroom are on each side of an apartment, with a kitchen and living room in the middle. If you desire to cook your meals, you need to bring your own cooking and eating utensils. Each bedroom has one double bed, and two bedrooms share one bathroom. If you signed up for a double accommodation, you will be assigned your own bedroom and share a bathroom with one other guest. If you signed up for a single accommodation, you will have a bathroom to yourself. Each apartment will house as many as four roommates or as few as two, depending of whether double or single housing options are chosen. Please note that the apartment doors lock but the bedroom doors do not lock. **No smoking or alcohol use is allowed in Manchester Village.**

Contacting residence hall staff: Prior to arriving on campus, our contact is Ms. Jennifer Fernandez, 619-260-4623. On campus, our program coordinator is Nicholas Severson. Ask at the front desk for his contact information.

Length of stay in Manchester Village: The Pacific Division reserved a block of rooms for the nights of Friday, June 16 through Saturday, June 24. Guests may choose which of these nights they wish to stay. There is no minimum length of stay.



Manchester Village, Front Entrance

Manchester Village parking: All persons staying on campus and driving a car must purchase a parking permit. The cost is \$5.00 for one to three nights and \$10.00 for four nights or more.

Shuttle service to the meeting: Manchester Village is about a ten minute (and a bit strenuous) walk to the Hahn University Center (where breakfast is served) and about ten minutes further to the Shiley Center for Science and Technology and Joan B. Kroc Institute for Peace and Justice, sites of the meeting. Regular shuttles service the University Center and upper campus. A schedule will be posted at the registration desk in Manchester.

Driving directions to Manchester Village: From either the east or west entrance to USD main campus (driving directions to campus are on page 12), turn left onto Linda Vista Road (public street bordering the south side of campus) to Via Las Cumbres (public street bordering the east side of campus); turn left (north) onto Via Las Cumbres and go approximately 0.2 miles. Re-enter campus through the opening in the chain link fence. Veer right, then left into a short dead-end street. Manchester Day Care Center is on the left; Manchester Village main entrance is at the dead-end of the short street past the traffic circle. A few short-term parking spaces are on the right. Enter Manchester Village main lobby (through the three narrow arches). The check-in desk is immediately across the lobby from the entry doors. Shuttle service to the main campus has a pick-up location at the traffic circle in front of Manchester Village and Day Care Center.

Check-in and Check-out: Check-in is at Manchester Village. The registration desk is normally staffed from 3:00 p.m. – 6:00 p.m. If arriving between 6:00 p.m. and 10:00 p.m., a telephone number to call will be posted on the door. Check-in is not ordinarily available after 10:00 p.m. Check-out is by 9:00 a.m. on the day of your departure.

On-Campus Dining: On-campus dining is available at several locations. The nearest facility, La Paloma, is conveniently situated at the Kroc Institute for Peace and Justice (just across the street from the Shiley Science Center). Its menu includes signature salads, sushi, soup, made-to-order gourmet and grilled sandwiches, homemade pasta, fresh baked pastries, breakfast bagels and a selection of Ryan Bros. coffees. Hours are Monday – Friday, 7:00 a.m.



La Paloma, from fountain in front of Kroc Institute for Peace and Justice

to 2:00 p.m. They are closed Saturday and Sunday. There are also several restaurants just down the hill from USD, a short but challenging walk from the meeting site. Registrants will be provided with a list of nearby restaurants for their dining pleasure.

Local off-campus accommodations: San Diego offers a wide variety of motels and hotels from which one may choose. The University of San Diego has a special relationship with the Bartell Hotels, and they offered meeting participants special rates and amenities at the following properties:

- **The Dana on Mission Bay**
1710 West Mission Bay Drive, San Diego, CA 92109
800-445-3339
Next to Sea World; about five to ten minutes to USD.
- **Days Inn Hotel Circle**
543 Hotel Circle, San Diego, CA 92108
800-227-4743
Close to historic Old Town; about ten minutes to USD.
- **Humphrey’s Half Moon Inn and Suites**
2303 Shelter Island Drive, San Diego, CA 92106
800-542-7400
Private marina and poolside waterfalls; about fifteen minutes to USD.
- **Best Western Island Palms Hotel & Marina**
2051 Shelter Island Drive, San Diego, CA 92106
800-922-2336
Private marina and panoramic views; about fifteen minute drive to USD.
- **Holiday Inn San Diego Bayside**
4875 North Harbor Drive, San Diego, CA 92106
800-662-8899
Near the airport and kids stay and eat free; about a ten minute drive to USD.
- **Pacific Terrace Hotel**
610 Diamond Street, San Diego, CA 92109
800-344-3370
Luxury accommodations on the ocean; about a fifteen minute drive to USD.

- **Radisson Hotel La Jolla**
3299 Holiday Court, La Jolla, CA 92037
800-333-3333
In La Jolla, just minutes from beaches, parks, golf and shopping. About a twenty minute drive to USD.
Close-by hotels that are not part of the Bartell group may be found by going on-line to <http://aresdirect.com/clients/usd/travel.html>.
Note that the AAAS, Pacific Division lists the above hotels and motels for information only, not as an endorsement for any specific commercial enterprise.

TRANSPORTATION and CAMPUS PARKING

By Automobile: The University of San Diego is located north of downtown San Diego to the east of Interstate 5. A campus map is located on page 2 of this *Proceedings*.

From the south (or the airport): Use I-5 North, exit Morena Blvd. (signs will say: Morena Blvd. use I-8 East). Stay to the right and follow the signs for Morena Blvd. Take the first right onto Linda Vista Rd. Travel to the third stoplight to USD’s East entrance, turn left and enter campus.

- If you are coming onto the campus for the meeting, turn left at the second stoplight (west entrance into USD). Proceed up the hill and turn left into the West Marian Way Parking Structure. Take the shuttle to the Kroc Institute for Peace and Justice (IPJ) or walk up the hill, turning right at the stop sign.

- If you are going to your on-campus housing, continue on Linda Vista Rd. and turn left onto Via Las Cumbres. Turn left into the Manchester Village Apartment complex.

From the north: Use I-5 South, exit Sea World Dr. & Tecolote Rd. and proceed left at stoplight toward Morena Blvd. Turn right onto Morena, left onto Napa, and left onto Linda Vista Rd.

- If you are coming onto the campus for the meeting, turn left at the first stoplight (west entrance into USD). Proceed up the hill and turn left into the West Marian Way Parking Structure. Take the shuttle to the Kroc Institute for Peace and Justice (IPJ) or walk up the hill, turning right at the stop sign.

- If you are going to your on-campus housing, continue on Linda Vista Rd. and turn left onto Via Las Cumbres. Turn left into the Manchester Village Apartment complex.

From the East: Use I-8 West, exit at Morena Blvd., go right onto Linda Vista Rd.

- If you are coming onto the campus for the meeting, turn left at the second stoplight (west entrance into USD). Proceed up the hill and turn left into the West Marian Way Parking Structure. Take the shuttle to the Kroc Institute for Peace and Justice (IPJ) or walk up the hill, turning right at the stop sign.

- If you are going to your on-campus housing, continue on Linda Vista Rd. and turn left onto Via Las Cumbres. Turn left into the Manchester Village Apartment complex.

By Air: San Diego is served by several commercial airlines that fly into Lindbergh Field (SAN). Lindbergh Field is about a 15 minute drive from the University.

REGISTRATION CENTER

The Registration Center is in the Rotunda of the Joan B. Kroc Institute for Peace and Justice (IPJ) on the University of San Diego campus. Hours for registration are:

Sunday, 2:00 – 5:00 p.m.

Monday, 7:30 a.m. – 5:00 p.m.

Tuesday, 7:30 a.m. – 4:30 p.m.

Wednesday, 8:00 a.m. – 3:00 p.m.

MESSAGES

To leave a message for a meeting registrant, call Kathleen Adkins at 619-260-4795. She is normally at this number Monday through Friday 8:00 a.m. – 3:30 p.m. A board for posting messages will be at the Registration Center. After hours messages may be left on voice-mail at the above number (it won't be checked until the following day) or leave a message with Anne Sturz at 619-260-4096, which will be checked more frequently. Messages for persons staying in Manchester Village (on-campus housing) may be left at 619-260-4623 between 8:30 a.m. and 5:00 p.m.

The AAASPD phone number for this meeting is 541-292-1115.

EMERGENCIES

If an emergency arises and no one is at the Registration Desk, contact one of these people:

Joan Kroc Institute for Peace and Justice – Louis Cappella, 619-260-7940, 8:00 a.m. to 4:00 p.m.

Shiley Center for Science and Technology – Starla Tudor, 619-260-8885, 7:30 a.m. to 4:00 p.m.

USD Office of Public Safety – 619-260-4600, 7:30 a.m. to 5:30 p.m.

After hours emergency: Public Safety Dispatch – X-2222 from any campus phone or 619-260-2222, any time or day.

After hours non-emergency: Public Safety Dispatch – X-7777 from any campus phone or 619-260-7777, any time or day.

E-MAIL

For those with laptops with wireless capabilities, both the Shiley Center for Science and Technology and the Kroc Institute for Peace and Justice have wireless access. Additionally, a limited number of computers for meeting registrants' use will also be available in IPJ, Room A.

SPEAKERS' PREVIEW ROOM

Speakers may preview their material in one of the Green Rooms that are accessed from the hallway behind the IPJ Theatre. Computers running Windows XP and PowerPoint 2003 will be available.



Joan B. Kroc Institute for Peace and Justice (IPJ).

BREAKS

Mid-morning and mid-afternoon breaks will be scheduled, as appropriate, for each session. Refreshments will be served during break times in IPJ Rooms A/B (Room A on Wednesday), near the Registration Desk in the Rotunda of IPJ.

MEETING ROOMS and TIMES of PRESENTATIONS

This year's technical sessions will meet primarily in the Joan B. Kroc Institute for Peace and Justice (IPJ) and also in the Shiley Center for Science and Technology (Shiley). Meeting rooms are equipped with computers running Windows XP and PowerPoint 2003, and a standard computer projector. Requests for other specialized equipment such as slide or overhead projectors must have made when presenters submitted their abstracts. Specialized equipment will be provided if available. If rental costs are incurred, payment will be the responsibility of the requestor. Speaker's Preview Rooms (the Green Rooms, accessed via the hall behind the IPJ Theatre), with projection equipment, will be open during the meeting. The meeting rooms and times of presentations are published in this "Program with Abstracts" issue of the *Proceedings* (vol. 25, part 1), which is given to those who register for the meetings. Final confirmation of the time and place of presentation was posted to the Pacific Division web site (pacific.aaas.org) starting fourteen days prior to the meeting.

COMPUTERS and POWERPOINT PRESENTATIONS

All meeting rooms are outfitted with computers running Windows XP, PowerPoint 2003, and data projectors. If you are planning to use PowerPoint for your presentation, you must make sure that it will run on this 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 PC running Windows XP.*

POSTER SESSION

One combined poster session will be held on Monday, 19 June in IPJ Conference Room B, which is immediately adjacent to the vendor show. Posters are to be set up by 9:00 a.m. Monday morning to allow registrants the opportunity to view them as time permits. Non-student presenters are expected to be present for at least one hour between 4:00 and 7:00 p.m. to discuss their work. Student posters will be judged for Awards of Excellence. Students must be present between 4:30 p.m. and 6:30 p.m. to allow judges the opportunity to discuss their work and to evaluate their posters. Posters should remain up until 9:30 p.m. to allow for extended viewing by meeting participants.

Posters will be assigned a display space of 48" tall X 48" wide (1.2 m X 1.2 m). Additional space may have been assigned by special request prior to May 13, 2006. By action of the Pacific Division Council in order to assure fairness, all student posters must fit within the assigned display space of 48" X 48" to be eligible for student Awards of Excellence. A request for extra space will disqualify a student from the award competition. Posters will be grouped by discipline and subject matter.

With the permission of Dr. Carol Waite Conner and the Geological Society of America, the Pacific Division has reprinted Dr. Conner's article, "The Poster Session: A Guide for Preparation." It can be found on the Division's web site, <http://pacific.aaas.org>. Click on the 87th Annual Meeting home page and then Poster Preparation (listed in the left column).

PUBLIC LECTURES and SPECIAL EVENTS

Members of the general public are invited to attend the public lectures at no cost. Special events require meeting registration and, for certain events, the payment of an additional fee.

Sunday, June 18

Public Lecture

7:00 p.m.

IPJ Theatre

Dr. David Wong (UCLA School of Dentistry) will present the talk, "Saliva Diagnostics: Powered by NanoTechnologies, Proteomics and Genomics." Dr. Wong recently reported on the ability to diagnose oral cancer by looking for RNA biomarkers in saliva (see Li, Y., St John, M.A., Zhou, X. Kim, Y., Sinha, U., Jordan, R.C., Eisele, D., Abemyor, E., Elashoff, D., Park, N.H. and Wong, D.T., "Salivary Transcriptome Diagnostics for Oral Cancer Detection." *Clinical Cancer Research*, 2004; 10:8442-8450). He is associate Dean of Research, School of Dentistry; Professor, Division of Oral Biology and Medicine; and Director, Dental Research Institute at the University of California, Los Angeles.

Sunday, June 18

Welcome Wagon and Cracker Barrel Mixer

8:00 – 9:30 p.m.

IPJ Reflecting Pool

All registrants and their families are invited to enjoy the conviviality of this social event, which is hosted by the Pacific Division and its affiliated societies and sections. A selection of soft drinks, chips, pretzels, and good conversation will be available.

Monday, June 19

Public Lecture

12:15 p.m.

IPJ Theatre

"From Brain Dynamics to Consciousness: How Matter Becomes Imagination," is the Monday noon public lecture, which will be presented by Dr. Gerald M. Edelman, co-winner of the 1972 Nobel Prize in Physiology or Medicine for his discoveries about the chemical nature of antibodies. More recently, Dr. Edelman has formulated and written extensively on a detailed theory to explain the development and organization of higher brain functions by means of a process known as neuronal group selection. Dr. Edelman is currently Director of The Neurosciences Institute and President of Neurosciences Research Foundation. He is also Professor and Chairman of the Department of Neurobiology at The Scripps Research Institute.

Monday, June 19

Public Lecture

7:15 p.m.

IPJ Theatre

Dr. Marlan O. Scully (Institute for Quantum Studies and Departments of Physics, Chemical and Electrical Engineering, Texas A&M University; Applied Physics Group, Mechanical and Aerospace Department and PRISM, Princeton University, Princeton, NJ 08544) will present the Monday evening public lecture, "The Demon and the Quantum: From the Pythagorean Mystics to Maxwell's Demon and Quantum Mystery."

Monday, June 19

USD President's Reception

8:15 – 9:30 p.m.

Shiley Science Atrium

University of San Diego President Dr. Mary Lyons will host an informal reception following the evening lecture. 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.

Tuesday, June 20

Public Lecture

12:15 p.m.

IPJ Theatre

Dr. Fred C.C. Peng, (Neurological Institute, Department of Neurosurgery, Veterans General Hospital–Taipei, Taipei, Taiwan, and chair of the Pacific Division Health Sciences Section) will present the Tuesday noon public lecture, “Dementia and Alzheimer’s Disease: Nosology of Fallacy.”

Tuesday, June 20

Reception and Student Awards Banquet

6:00 p.m.

IPJ Reflecting Pool
and Rooms B, C and D

The Divisional Banquet will be held Tuesday evening beginning at 6:00 p.m. It will begin with a no-host cash bar reception held by the Reflecting Pool, at the rear of the Kroc Institute for Peace and Justice. It will move indoors to Rooms B, C and D for the dinner and festivities. The cost is \$30 per person, with advance sign-up. If you didn’t sign up in advance but would like to attend the banquet, inquire at the Registration Desk whether additional tickets are available. A portion of the banquet cost helps to support student attendance at the banquet. Students who are in competition for an Award of Excellence are invited to attend at no charge as guests of the Division. If you are a student who did not request a ticket in advance, ask at the Registration Desk whether additional tickets are available. The following entrees are offered for dinner: Chicken Cordon Bleu (a lightly breaded and boneless breast of chicken stuffed with ham and imported Swiss cheese, baked to a golden brown), Paradise Mahi Mahi (a boneless filet, seasoned with bread crumbs, baked and topped with macadamia nuts), and Spanokopita for those desiring a vegetarian offering. All meals include a “yummy” baby spinach salad, chef’s choice vegetables, wild rice pilaf, dessert and coffee (with dessert).

Following dinner, AAAS Pacific Division President Kathleen M. Fisher will present the Presidential Lecture, “*My Life as a Scientist / Educator Dilettante*,” and Division representatives will announce the names of student winners of 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.



Kroc Institute for Peace and Justice, rear view with Reflecting Pool.

Larus Travel Award, which provides for travel and other expenses for the awardee to attend the 2007 annual meeting of AAAS in San Francisco, CA February 15 - 19, in order to present his/her winning presentation as a poster.

The Klauber, Lindsay, Dutro, Presidents’, Best Poster, Peterson, and AAAS Larus awards are given to those students whose presentations are judged the most significant in the advancement or understanding of science. Eligible students must: (1) be registered for the meeting, (2) present the paper or poster, and (3) 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). The evaluation forms (oral and poster) are posted on the Division’s web site.

Wednesday, June 21

Business Meeting of the Council of the Pacific Division

7:00 – 9:00 a.m.

IPJ Boardroom (room 226)

The Council of the AAAS, Pacific Division will hold its annual breakfast and business meeting at 7:00 a.m. on Wednesday, June 21 in the Boardroom (room 226) of the Kroc Institute for Peace and Justice. The Council will elect officers, discuss programs for the 2007 and 2008 annual meetings, and transact such other business as is required by the Division’s By-Laws.

Wednesday, June 21

Public Lecture

12:15 p.m.

IPJ Theatre

Public Lecture. The Wednesday noon public lecture, *Antiquity’s Fingerprints in an Ice Core: A Cosmic Encounter, A Cat’s Eye, and Us Modern Humans*, will be presented by Aden and Marjorie Meinel¹, with David Drach-meinel² and Barbara Meinel² (¹retired, University of Arizona, Tucson, AZ and Jet Propulsion Laboratory, California Institute of

Technology, Pasadena, CA; ²The Meinel Group, Las Vegas, NV and Mexico City MX. Dr. and Mrs. Meinel have had long and distinguished careers, extending from the early 1940s, in the field of telescopic optics, including helping to design the Keck Observatory in Hawaii, the Kitt's Peak Observatory in Arizona and the Hubble Space Telescope. More recently they have developed an interest in possible causative agents of ice ages and are now investigating possible reasons for the emergence of modern humans and numerous other species about 40,000 years ago.

STUDENT AWARDS for EXCELLENCE

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 will also receive a one year student membership in AAAS, which includes weekly issues of the journal *Science*. Societies often supplement these awards with their own cash prizes.

In 2006, 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 2007 national meeting of AAAS in San Francisco, CA, February 15 - 19, 2007, for the purpose of presenting their winning presentation as a poster. The Klauber, Lindsay, Dutro, Presidents', Peterson, Best Poster, and Larus awards are given to those students whose presentations are judged the most significant in the advancement or understanding of science.

To be eligible for a sectional award or one of these Divisional awards, a student must register 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). The evaluation forms for both oral and poster presentations are posted on the Division's web site. Students who are eligible for Awards of Excellence are invited to be the Division's guests at the Division Banquet Tuesday evening, June 20. Festivities that evening include the presentation of student awards. If you are one of these students, please be sure to fill in the appropriate boxes on the Advance Registration form to let us know you will be attending the dinner and which entrée you wish to have.

FIELD TRIPS

All field trips are open to meeting registrants and their families. Due to limited space, advance registration is required for all trips. Occasionally, cancellations occur. If you are interested in one or more of these excursions, please check on availability of space at the Registration Desk.

All field trips depart from and return to the main entrance to the Shiley Center for Science and Technology on the University of San Diego campus. Departure times are absolute. Return times are approximate. Plan to arrive a few minutes early. It's always a good idea to bring along a day pack and extra water, especially if the weather is warm. Please dress according to the weather and bring a hat and sun screen. Depending on the activities of the field trip, you may want to include a pair of binoculars, a camera and/or other items.

If you are going on the Saturday or a Sunday field trip, Pacific Division staff will be providing drivers with lists of participants so you do not need to worry about picking up your registration packet in advance. If you return after the Registration Desk has closed, registration will open at 7:30 a.m. on Monday.

SATURDAY – SUNDAY

(1) *Environmental Issues In and Around the Guadalupe Valley, Baja California, Mexico.* Saturday, June 17: 8:00 a.m. – Sunday, June 18 at about 7:00 p.m. Departs from the main entrance to the Shiley Center for Science and Technology.

Fee: \$210 per person, double occupancy, \$275 single occupancy, which includes transportation via air conditioned charter bus, lunches both days, road log, and Saturday night hotel accommodations. Participants are responsible for purchasing their own dinner Saturday and breakfast Sunday morning.

Led by Dr. Thomas Kretschmar (Centro de Investigación Científica y de Educación Superior de Ensenada (CICESE)), participants will have the opportunity to explore one of the most beautiful regions of northern Baja California, the Guadalupe Valley. The Guadalupe Valley is home of the largest wine producer in Mexico, L.A. Chetto, and also hosts several mid-size wineries such as Monte Xanic and Chateau Camou, and several boutique wineries such as El Mogor and Casa de Piedra. Ninety five percent of the Mexican wine production comes from this valley. A visit to two wineries will be included in this trip, giving participants the opportunity to gain insights into the wineries as well as a taste of some of their products. Other stops will include discussions of environmental problems caused by land development and brush fires, viewing and discussing the fracture and landslide zones of the Rosarito Formation, a visit to the Russian museum in El Provenir to gain insight into the early settlers of the area, a discussion of saltwater intrusion and its implications on drinking water and

agriculture in Maneadero, and visits to San Antonio Necua (a local Indian tribal area) and La Bufadora. There may be brief opportunities to purchase local handcrafts. Saturday night will be spent at a hotel in Ensenada.

Important note: a valid, government-issued photo identification card or passport is required. Participants will be asked to show their identification before leaving on the trip. Those who do not have proper identification will not be allowed on the trip and they will forfeit their field trip fee.

Stops will include a minimal amount of walking, so you might want to bring walking shoes. Also, the weather can be cool on the coast (Ensenada, La Bufadora and Punta Banda) and quite warm in the interior valleys (Guadalupe Valley). Although no special clothing is required, we suggest you plan your clothing carefully to take into account these possible extremes in weather.

SUNDAY

(2) *San Diego Coastal Geology*. Sunday, June 18: 9:00 a.m. - 4:30 p.m. Departs from in front of the Shiley Center for Science and Technology.

Fee: \$40, which includes transportation, entrance fees, and box lunch.

This excursion, led by Elizabeth Baker and Eric Cathcart (Department of Marine Science and Environmental Studies, University of San Diego, San Diego, CA), focuses on the sedimentary rocks that record the last 65 million years of geologic history in the San Diego coastal region. The depositional environment, local tectonic and fault activity, as well as the larger scale tectonic framework will be discussed, including how this relates to the San Andreas Fault. We plan to stop first at Torrey Pine State Beach, then progress south to La Jolla and finish at scenic Cabrillo National Monument. Be sure to bring comfortable walking shoes. A hat and sunscreen are recommended. The coastal region can be cool and foggy. Dress appropriately and consider layering if it seems appropriate.

WEDNESDAY

(4) *Star Party*. Wednesday, June 21: 4:00 p.m. – about 11:30 p.m. Departs from in front of the Shiley Center for Science and Technology.

Fee: \$50.00, which includes transportation, program at the observatory and assorted fees. Dinner in Alpine is on your own.

Co-sponsored by the Mount Laguna Observatory (operated by San Diego State University), this field trip travels to the Mount Laguna Observatory (about an hour and a half travel time) for an evening of stargazing. We will stop for an early dinner (on your own) in Alpine on the way to the observatory. Once we arrive at the observatory there is a short hike from the parking lot up to the facility. Also, be

sure to bring appropriate clothing for a cool evening in the mountains!

WORKSHOPS

SCIENCE EDUCATION ENRICHMENT

Saturday, June 17

IPJ, Rooms C and D

Teaching Scientific Literacy and Critical Thinking Across Disciplines: Hands-on Workshops for Teachers of High School, Community College and University Students. Organized by Annette Taylor (Department of Psychology, University of San Diego, San Diego, CA; e-mail: taylor@sandiego.edu). This all-day workshop focuses on scientific literacy skills applicable to a wide variety of subjects and contexts. Following an opening session, participants have the option of choosing sessions from two concurrent tracks. The day concludes with a closing session for everyone. Workshop participants were asked to preregister, although a limited number of participants may be accommodated the day of the workshop.

Fee: There is no additional fee for this workshop for those who register for and plan to attend the full AAAS Pacific Division meeting. For those planning to attend only this workshop and not register for the full meeting, the following fee schedule applies: K – 14 teacher, graduate student preparing to teach K – 14, \$20; everyone else, \$30.

Tuesday, June 20

IPJ, Rooms E and F

Collaborative Lesson Study: Enhancing the Quality of Teaching Science Through Practice. Co-organizers: Marisa Ramirez (Science Resource Teacher, Elementary, San Diego City Schools, San Diego, CA; e-mail: mramirez2@sandi.net) and Jill Brownlee (Science Resource Teacher, Secondary, San Diego City Schools, San Diego, CA; e-mail: jbrownlee@sandi.net). Collaborative Lesson Study is a collegial mentoring process designed to improve teacher quality by focusing on lesson study. Collaborative Lesson Study provides opportunities for professional dialogue and critical reflection based on planning and teaching a lesson, examining student work, and refining lessons based on student outcome. Collaborative Lesson Study is adapted from the WestEd version of the Teaching and Learning Collaborative to the needs of a large-scale professional development effort for the teaching and learning of science, grades K-12, in San Diego City Schools, an urban school district of 180,000 students.

Participants of this session will develop an awareness of the Collaborative Lesson Study protocol through examining student work, video and dialogue. The Collaborative Lesson Study process focuses on the cause and effect of lesson design

and decisions by a collaborative of teachers as evidenced in student understanding. The CLS process builds trusts and lays the foundation for collegial work, joining veteran and new teachers with the goal of continuous improvement.

The CLS protocol is based on the use of the 5E Lesson Design inquiry model, analyzing the conceptual flow of a learning sequence, and engaging students in discourse and writing to communicate their conceptual understanding of the content and ability to develop and utilize science process skills.

HANDS-ON PRACTICE with MOLECULAR BIOLOGY KITS

Bio-Rad Corporation of Hercules, CA, will present several hands-on workshops to give middle school, high school and university instructors the opportunity to try out some of the molecular biology kits they offer to educators. Bio-Rad representatives will provide certificates of attendance for those desiring to utilize these workshops for professional development credits.

There is no additional charge for these workshops. However, participants must be registered for the meeting. A special Bio-Rad Workshop Only meeting registration is available for \$20.00, which includes as many sessions as you wish to attend. Please be sure to wear our meeting badge to each session. Space is on an “as-available” basis. Although advance registration was required, there may be additional space available. If you would like to attend one or more of these workshops but did not register for them, please inquire at the Registration Desk to see whether space is yet available. Participation is limited to 24 (at Bio-Rad personnel discretion) in each session.

Wednesday, June 21
Shiley, ST 330

8:30 a.m. – 10:00 a.m. Bio-Rad Genes in a Bottle™ Kit
Can you see your DNA? Enable your students to visualize and comprehend their DNA, the normally invisible substance of life. With this kit, students extract genomic DNA from their own cheek cells, then precipitate and capture it in a fabulously cool necklace.

10:30 a.m. – 12:00 p.m. Bio-Rad ELISA Immuno Explorer Kit
Biology’s magic bullet? Simulate the outbreak of a disease in your classroom and use real antibodies to track it. Teach your students how diseases (HIV) and markers of cancer, pregnancy, or drug use are diagnosed.

1:30 p.m. – 4:00 p.m. Bio-Rad PV92 PCR Informatics Kit
What genes are you wearing? Fingerprint your own DNA using forensic DNA extraction techniques, PCR amplification and electrophoresis. Using their actual kit results, this kit allows your students to test the Hardy-Weinberg equilibrium theory within their own classroom population, then go online to compare classroom results to population data worldwide. AP LAB 8

Thursday, June 22
Shiley, ST 330

9:00 a.m. – 11:30 a.m. Bio-Rad GMO Investigator™ Kit
Have your favorite foods been genetically modified? Genetically modified foods do not require labeling in the USA. Using state-of-the-art DNA extraction techniques, PCR, and electrophoresis, this kit allows your students to verify whether their favorite foods have been genetically modified, or not.

1:00 p.m. – 3:30 p.m. Bio-Rad Comparative Proteomics Kit
Is there something fishy about teaching evolution? Extract muscle proteins from closely and distantly related fish species, use protein electrophoresis (SDS-PAGE), generate species specific protein fingerprints, and create cladograms to infer evolutionary/phylogenetic relationships. Can molecular evidence be used to support or refute evolutionary theory? Your students decide.

VENDOR FAIR

The Pacific Division is pleased to announce the presence of a limited number of vendors who have chosen to provide information about their companies at this meeting. All vendors are located in IPJ, Conference Room A. Hours are
Monday 9:00 a.m. – 5:00 p.m.
Tuesday 9:00 a.m. – 5:00 p.m.

Please stop by and visit the following vendors:

Salford Systems has been a leading developer of state-of-the-art data mining and predictive modeling software since 1993. Our flagship products, CART®, MARS®, TreeNet™, and RandomForests™ are based on cutting edge research at Stanford University and UC Berkeley, and have been in successful commercial and academic use for over a decade. CART, MARS, TreeNet and RandomForests have been proven in the most demanding data mining analyses. Scientific applications in both software and consulting span DNA microarray data analysis, proteomics, drug discovery, fraud detection, risk management, environmental forecasting, biodiversity and manufacturing quality control. Industries using Salford Systems products and consultation services include telecommunications, transportation, banking, financial services, insurance, health care, manufacturing and pharmaceutical research. Salford Systems’ tools have accumulated ten major data mining awards since August 2000. Furthermore, Salford Systems data mining tools continue to win honors and awards and we are the only major data mining software provider with this kind of proven performance track record.

Airgas is the United States’ largest distributor of industrial, medical, and specialty gases and related equipment, safety supplies and MRO products and services to industrial and commercial markets. We have over 55 branches in South-

ern California, Nevada, and Arizona. At Airgas, our business success begins with the customer. Whether our drivers are delivering gases or branch associates are delivering advice, we are driven to build relationships with customers that exceed their expectations so that we can live up to our promise that "You'll find it with us."

As our relationships grow, customers ask us to do more to manage the supply chains for gases, hardgoods and safety products, so they can spend more time on their business. Almost a third of our 1,000 sales people are specialists with deep knowledge of safety products, specialty and medical gases. Airgas has an extensive national network of specialty gas laboratories. More than half are certified to the ISO 9001:2000 standard for quality management systems, and several are also certified to the stringent ISO 17025 standard for analytical laboratory performance. Our network includes more than 60 specialty gas laboratories, more than 300 gas filling locations, and nearly 900 service locations nationwide. These resources add up to the largest specialty gas supply network in the country.

Mettler Toledo specializes in the area of precision instruments for professional use. In addition to a wide product array, we offer the most comprehensive range of services in

our industry on a global level. Laboratories are a key market for us. Mettler Toledo instruments are used in research, scientific, drug discovery, and quality control labs, amongst many others in the pharmaceutical, chemical, food and cosmetics industries. Our solutions apply to virtually every laboratory around the world. In fact, we are a global market leader with the three instrument groups most frequently used in the laboratory (balances, pipettes, and pH meters), and we are a pioneer in the field of Automated Chemistry.

Fisher Scientific International Inc. is a leading provider of products and services to the scientific-research community and clinical laboratories. We serve pharmaceutical and biotech companies; colleges and universities; medical-research institutions; hospitals, reference, quality-control, process-control and R&D labs in various industries; as well as government agencies. From biochemicals, cell-culture media and proprietary RNAi technology to rapid-diagnostic tests, safety products and other consumable supplies, Fisher provides an unmatched suite of more than 600,000 products and services to its 350,000 customers worldwide. This broad offering, combined with Fisher's globally integrated supply chain and unmatched sales and marketing presence, helps make our customers more efficient and effective at what they do.



Data Mining Software from the
creators of CART®, Random Forests™
MARS™ and TreeNet™ / MART®

*The standard against which all
other data mining tools are judged*



TreeNet, Jerome Friedman's revolutionary data mining tool, is based on boosted decision trees. TreeNet is an astonishingly accurate model builder and function approximation system that also serves as a powerful initial data exploration tool. Use TreeNet to extract the most important relationships in data and calibrate how predictable the outcomes are. Then either use the TreeNet model directly, or incorporate the results in CART, MARS, or conventional statistical models.



Random Forests, Leo Breiman's latest data mining technology, is based on learning ensembles of CART trees. By judiciously injecting randomness into the tree building process and then combining hundreds of these trees, RF is able to deliver high performance predictive models and a variety of novel exploratory data analysis results. Random Forests also incorporates new metric-free CLUSTER analyses that automatically select the variables used to define each cluster, with potentially different variables defining each cluster.

CART®

Salford Systems' CART is the only classification and regression tree software based on the original proprietary source code developed by Breiman, Friedman, Olshen, and Stone. We have been working with these researchers since 1990 to perfect the tree-based engine to provide a celebrated and award-winning system.



Jerome Friedman's MARS, Multivariate Adaptive Regression Splines, is stepwise regression done right for the first time. MARS does variable selection, variable transformation, interaction detection, and self-testing to prevent overfitting, all automatically. Like CART, there is only one trademarked MARS, and it is available exclusively from Salford Systems.



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Download Software at: www.salford-systems.com

Olympus America, Inc. is a global corporation with extensive R&D resources, a vast product offering and facilities around the world. Olympus began in 1919 (under the name Takachiho Seisakusho) with one goal: to become a leader and innovator in the mass production of microscopes. As a testament to the blending of innovative ideas, advanced technology, and manufacturing know-how — a combination that has nourished our growth and satisfied our customers for more than three quarters of a century — the company did, indeed, make a strong entry into the market with its first microscope, the Asahi, just one year after its origination. By 1921 we had begun to use Olympus as our brand name; by 1935 we had opened a world-class optical research facility dedicated to creating the finest possible camera lenses. From the world's first gastrocamera in 1950—which

initiated our involvement with medical systems and health care equipment—to pioneering development of compact SLR cameras and the world's first Microcassette® recorder, Olympus has continued to create successful responses to market needs around the world—like clinical blood analyzers, powerful microscope systems, and breakthrough digital cameras. At Olympus, our ideas have proliferated as rapidly as the technology has evolved. We have channeled them both into the groundbreaking products that our changing world requires—products like acoustic microscopes, ultrasonic endoscopes, reagent AIDS detection, and digital voice recorders. Or, like the Infinity Stylus, one of the best-selling cameras in history. Today, 82 years after we made our first microscope, we remain as young, as eager, as curious and as vigorous as we were in the beginning.



JOIN US IN BOISE, IDAHO
17 – 21 JUNE 2007

AAAS
PACIFIC DIVISION
88TH ANNUAL
MEETING

Original photograph courtesy of Boise Convention and Visitors Bureau.

GENERAL SESSIONS

Sunday, June 18

EVENING PUBLIC LECTURE

IPJ Theatre
Sunday
7:00 p.m.

Saliva Diagnostics: Powered by NanoTechnologies, Proteomics and Genomics, Dr. David Wong (Associate Dean of Research, School of Dentistry; Professor, Division of Oral Biology & Medicine; Director, Dental Research Institute, University of California, Los Angeles, Los Angeles CA).

WELCOME WAGON/CRACKER BARREL

IPJ Reflecting Pool
Sunday
8:00 – 9:30 p.m.

Hosted by the Pacific Division and its affiliated societies and sections, all registrants and their families are invited to enjoy the conviviality of this social event. A selection of soft drinks, chips, pretzels, and good conversation will be available.

Monday, June 19

VENDOR FAIR

IPJ Conference Room A
Monday
10:00 a.m. – 5:00 p.m.

NOON PUBLIC LECTURE

IPJ Theatre
Monday
12:15 p.m.

From Brain Dynamics to Consciousness: How Matter Becomes Imagination, Dr. Gerald M. Edelman (The Neurosciences Institute, San Diego, CA).

EVENING PUBLIC LECTURE

IPJ Theatre
Monday
7:15 p.m.

The Demon and the Quantum: From the Pythagorean Mystics to Maxwell's Demon and Quantum Mystery, Dr. Marlan O. Scully (Institute for Quantum Studies and Departments of Physics, Chemical and Electrical Engineering, Texas A&M University; Applied Physics Group, Mechanical and Aerospace Department and PRISM, Princeton University, Princeton, NJ).

USD PRESIDENT'S RECEPTION

Shiley Science Atrium
Monday
8:15 – 9:30 p.m.

University of San Diego President Dr. Mary Lyons will host an informal reception from 8:15 to 9:30 p.m. 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.

Tuesday, June 20

VENDOR FAIR

IPJ Conference Room A

Monday

10:00 a.m. – 3:00 p.m.

NOON PUBLIC LECTURE

IPJ Theatre

Tuesday

12:15 p.m.

Dementia and Alzheimer's Disease; Nosology of Fallacy, Dr. Fred C.C. Peng (Department of Neurosurgery and Neurological Institute, Taipei Veterans General Hospital, Taipei, Taiwan).

RECEPTION and STUDENT

AWARDS BANQUET

IPJ Reflecting Pool

Conference Rooms B, C and D

Tuesday

6:00 p.m.

The annual Pacific Division Student Awards Banquet will be held Tuesday evening. A no-host reception, including a cash bar, starts at 6:00 p.m. by the Reflecting Pool to the rear of the Joan B. Kroc Institute for Peace and Justice. At about 7:00 p.m. the festivities will move indoors to Conference Rooms B, C and D for dinner. The cost is \$30.00, and you must have purchased tickets in advance. If you failed to purchase a ticket and would like to attend the banquet, please inquire at the Registration Desk prior to 5:00 p.m. Tuesday to see whether additional tickets are available. Students who are in competition for Awards of Excellence are invited to be guests of the Division for this event. Students must have indicated their intention of attending the banquet on their registration form. Following dinner will be the announcement of the winners of the Awards of Excellence for the affiliated societies and sections of the Pacific Division. Winners of Division-wide awards will also be announced. Following the presentation of student awards, Dr. Kathleen M. Fisher, AAAS Pacific Division President and Professor of Biology and Director of the Center for Research in Mathematics and Science Education at San Diego State University will top off the evening by giving the annual Presidential Lecture, “*My Life as a Scientist / Educator Dilettante.*”

Wednesday, June 21

COUNCIL of the PACIFIC DIVISION

IPJ Boardroom (room 226)

Wednesday

7:00 – 9:00 a.m.

The Council of the AAAS, Pacific Division will hold its annual breakfast and business meeting at 7:00 a.m. on Wednesday, June 21 in the Boardroom (room 226) of the Kroc Institute for Peace and Justice. The Council will elect officers, discuss programs for the 2007 and 2008 annual meetings, and transact such other business as is required by the Division’s By-Laws.

NOON PUBLIC LECTURE

IPJ Theatre

Wednesday

12:15 p.m.

Antiquity's Fingerprints in an Ice Core: A Cosmic Encounter, A Cat's Eye, and Us Modern Humans, Dr. Aden and Mrs. Marjorie Meinel¹, with Mr. David Drach-meinel² and Ms. Barbara Meinel² (¹retired, University of Arizona, Tucson, AZ and Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA; ²The Meinel Group, Las Vegas, NV and Mexico City MX).

TECHNICAL SESSIONS

1100 (time italicized and underlined) indicates a student presentation in competition for Awards of Excellence

* indicates the speaker from among several authors listed

I. SYMPOSIA

Monday, June 19

HALF-DAY SYMPOSIA

Monday Morning

STRATEGIES for PROMOTING ACTIVE LEARNING in COLLEGE BIOLOGY CLASS- ROOMS: LESSONS from PROJECT FIRST

IPJ, Room 217

Monday

8:50 a.m. – 12:00 p.m.

Program Organizers: Kathy S. Williams and Kathleen M. Fisher (Department of Biology; Center for Research in Mathematics and Science Education, San Diego State University, San Diego, CA).

Sponsored by: Pacific Division Sections on Biological Sciences and Education.

In classrooms around the world, faculty are learning that by incorporating inquiry-based approaches and active-learning strategies into classrooms, students become more engaged in learning and their acquisition of knowledge can be increased. Project FIRST (Faculty Institutes for Reforming Science Teaching) is an NSF funded faculty development program designed to help college biology faculty design and implement novel educational practices in their classrooms. This national program has a node based at San Diego State University, with faculty teams working together at several colleges in the area to improve learning by all students. By using various tools, such as concept mapping, using concept questions and wireless response systems, collecting real-time data and analyzing it, and employing embedded assessment of various types, faculty are collecting data to inform their teaching and enhance student learning and retention. This symposium will present some of these strategies, and demonstrate how science faculty can design classroom activities and collect data about teaching and learning in different courses and classroom settings.

Chair: Kathy S. Williams (San Diego State University, San Diego, CA).

0850 *Welcome and introductions.*

0900 *Introduction to and Overview of Project FIRST (Faculty Institutes for Reforming Science Teaching), KATHY S. WILLIAMS* (Department of Biology, San Diego State University, San Diego, CA).

0930 *Exploring the World Ocean: A New, Inquiry-Based “Tool” for Teaching 21st Century Oceanography, W. SEAN CHAMBERLIN* (Earth Sciences, Fullerton College, Fullerton, CA).

1000 **BREAK**

1020 *The Field Trip: Bringing It Home, LESLIE SEIGER* (Biology Department, San Diego Mesa College, San Diego CA).

1050 *Using Classroom Performance System (CPS) to Gauge Conceptual Understanding in the Biology Classroom, ERIN REMPALA* (Biology Department, San Diego Mesa College, San Diego CA).

1120 *Activating the Curriculum: Evaluating the Success of Curriculum Changes, DOUGLAS H. DEUTSCHMAN* (Department of Biology, San Diego State University, San Diego, CA).

1150 *Wrap-up: further discussion and questions.*

HALF-DAY SYMPOSIA

Monday Afternoon

PROGRAMMATIC ASSESSMENT in BIOLOGY USING DIAGNOSTIC ASSESSMENT ITEMS

IPJ, Room 217

Monday

1:45 p.m. – 4:10 p.m.

Program Organizer: Kathleen M. Fisher (Department of Biology; Center for Research in Mathematics and Science Education, San Diego State University, San Diego, CA).

Sponsored by: Pacific Division Sections on Biological Sciences and Education.

University departments across the country are increasingly evaluating the effectiveness of their programs. The desired outcome is to find out what works well and what doesn't, and use this information to make improvements in the overall instructional plan. The Biology Department at San Diego State University is using diagnostic tests in pre- and post-testing of biology majors and non-majors across semesters to track students' overall learning progress. Programmatic assessment is significantly different from evaluating either students or professors. We have chosen to use diagnostic tests because they have a strong research base and are powerful in revealing learning gains (or lack thereof). A 'diagnostic' (also known as 'distractor-driven') test is a multiple-response test in which each distractor represents a common naive conception that is held by many students. Students' naive conceptions (also known as misconceptions) are their particular prior knowledge and beliefs that often significantly interfere with new learning. One example is the failure by many students to comprehend that plants construct themselves largely out of carbon dioxide from the air, because (at least in part) of a strongly entrenched belief that air has no weight and couldn't possibly be used to construct a tree. We feel that if we can make significant gains against these 'resistant' ideas, then we can consider our program effective. Instructional response theory provides a method for inferring the best order of presentation of concepts within a larger topic (such as the various concepts that comprise natural selection) from student performance on distractor-driven tests.

Chair: Kathleen M. Fisher (San Diego State University, San Diego, CA).

1345 *Welcome and introductions.*

1350 *Introduction to and Overview of Programmatic Assessment and Diagnostic Tests, KATHLEEN M. FISHER* (Biology, Center for Research in Mathematics and Science Education, San Diego State University, San Diego, CA).

1420 *Developing and Evaluating the Conceptual Inventory of Natural Selection, DIANNE ANDERSON* (Biology Department, Point Loma Nazarene University, San Diego, CA).

1450 **BREAK**

1510 *Using Item Response Theory to Visualize Conceptual Change, BRYCE BATTISTI* (School of Education, University of California, Davis, CA).

1540 *Programmatic Assessment of the SDSU Biology Program Using Diagnostic Testing, KATHY WILLIAMS* (Biology Department, San Diego State University, San Diego, CA).

FULL-DAY SYMPOSIA

Monday

ORGANIC AEROSOL CHEMISTRY/ TURBULENCE and MIXING

IPJ, Rooms H and I

Monday

8:10 a.m. – 4:45 p.m.

Program Organizers: David De Haan¹ and Frank Jacobitz²
(¹Department of Chemistry and Biochemistry and
²Mechanical Engineering Program, University of San Diego, San Diego, CA).

Sponsored by: Pacific Division Sections on Chemistry and Engineering and Industrial Sciences.

The formation of organic aerosol affects climate globally and human health regionally. Since Southern California is heavily impacted by particulate air pollution, it has become a major center of atmospheric aerosol research. This morning session will address significant chemical processes and measurement techniques that are characterizing the chemistry occurring in, and on the surface of, these particles. Laboratory work, field studies, and theoretical approaches will be brought to bear on problems such as the formation of submicron particles from organic precursor gases, the speciation of single aerosol particles, the influence of oligomerization reactions on particle volatility, and effects of particle surfaces on gas-phase photochemistry. This session is linked to the afternoon session entitled "Turbulence and Mixing in Geophysical Flows," which addresses the dynamics involved in air pollution and oceanic modeling.

The afternoon session covers turbulence and mixing processes in atmospheric and oceanic flows. The session will combine contributions from theoretical, numerical, experimental, and field studies, and will bring together contributors from atmospheric and oceanic fields, as well as from engineering, physics, or mathematics. This session is linked to the morning session entitled "Organic Aerosol Chemistry," which addresses significant chemical processes and measurement techniques that are characterizing the chemistry of particulate air pollution.

Chair: David De Haan (University of San Diego, San Diego, CA).

0810 *Welcome and introductions.*

0820 *Why Glyoxal and Methyl Glyoxal Won't Evaporate: Cloud Processing and Triggered Polymer Formation, KIRSTEN W. LOEFFLER, CHARLES A. KOEHLER, NICOLE M. PAUL, and DAVID O. DE HAAN** (Department of Chemistry and Biochemistry, University of San Diego, San Diego CA).

0845 *Microscopy and Spectroscopy of Organic Functional*

Groups in Atmospheric Particles, **LYNN M. RUSSELL^{1*}**, **STEFANIA GILARDONI¹**, **SATOSHI TAKAHAMA¹**, and **MARY K. GILLES²** (¹Scripps Institution of Oceanography, University of California at San Diego, La Jolla, CA; ²Chemical Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, CA).

0910 *Aerosol Formation and Processing from Reactions of Unsaturated Organic Compounds with Nitrate Radicals*, **KENNETH S. DOCHERTY**, **HUIMING GONG**, **AIKO MATSUNAGA**, and **PAUL J. ZIEMANN*** (Air Pollution Research Center, University of California, Riverside, CA).

0935 *Photo-polymerization of Aqueous Pyruvic Acid*, **M. I. GUZMÁN**, **A. J. COLUSSI**, and **M. R. HOFFMANN*** (W. M. Keck Laboratories, California Institute of Technology, Pasadena, CA).

1000 **BREAK**

1020 *Secondary Organic Aerosols: Contributions of First and Second Generation Reaction Products*, **NGA L. NG**, **JESSE H. KROLL**, **VARUNTIDA VARUTBANGKUL**, **JOHN H. SEINFELD**, and **RICHARD C. FLAGAN*** (California Institute of Technology, Pasadena, CA).

1045 *Interactions of Nitrate Aerosols with Biogenic Organic Compounds*, **EZELL, M.J.***, **YU, Y.***, **MCINTIRE, T.M.**, **D'ANNA¹, B.**, and **FINLAYSON-PITTS, B.J.** (Department of Chemistry, University of California, Irvine; ¹Laboratoire d'Application de la Chimie à l'Environnement, Villeurbanne Cedex, France).

1110 *Is Secondary Organic Aerosol Formation from Anthropogenic Pollution Controlled by Physical or Chemical Processes?* **RAINER VOLKAMER** (University of California - San Diego, Department of Chemistry and Biochemistry, La Jolla, CA).

1135 *Physico-Chemical and Toxicological Characteristics of Ambient Ultrafine Particles*, **CONSTANTINOS SIOUTAS** (Civil and Environmental Engineering, University of Southern California, Los Angeles, CA).

1200 **LUNCH**

Chair: Frank Jacobitz (University of San Diego, San Diego, CA).

1330 *Laboratory Modeling of a Simple Urban Environment*, **MARKO PRINCEVAC***, **TAYLOR RAY COLE**, and **XIANGYI LI**, (University of California, Riverside, Riverside, CA).

1355 *Turbulence in Rotating Stratified Shear Flow*, **FRANK JACOBITZ** (University of San Diego, San

Diego, CA).

1420 *Internal Wave Refraction Leading to Wave Breaking and Mixing in the Ocean*, **JULIE C. VANDERHOFF***, **JAMES W. ROTTMAN**, and **KEIKO K. NOMURA** (Department of Mechanical and Aerospace Engineering, University of California, San Diego, La Jolla, CA).

1445 *Simulations of a Stratified Shear Layer*, **KYLE BRUCKER*** and **SUTANU SARKAR*** (University of California, San Diego, La Jolla, CA).

1510 **BREAK**

1530 *Vertical Oceanic Heat, Mass, Momentum, and Information Transport by Beamed Fossil and Zombie Turbulence Maser Action Mixing Chimneys*, **CARL H. GIBSON** (Departments of Mechanical and Aerospace Engineering and Scripps Institution of Oceanography, University of California at San Diego, La Jolla, CA).

1555 *Turbulent Dispersion in Stably Stratified Homogeneous Shear Flow*, **LINHDUNG PHAM***, **JAMES W. ROTTMAN**, and **KEIKO K. NOMURA** (Department of Mechanical and Aerospace Engineering, University of California, San Diego, La Jolla, CA).

1620 *Large Eddy Simulation of a Stratified Benthic Ekman Layer*, **JOHN R. TAYLOR** and **SUTANU SARKAR** (University of California, San Diego, La Jolla, CA).

NEW HUMANITIES and SCIENCE CONVERGENCES II

IPJ, Room 218

Monday

8:15 a.m. – 5:00 p.m.

Program Organizers: Robert Louis Chianese¹ and Carl A. Maida² (¹Department of English, California State University, Northridge, CA; ²Schools of Dentistry and Medicine, University of California, Los Angeles, CA)

Sponsored by: Pacific Division General and Interdisciplinary Section.

This multidisciplinary symposium explores new or recent connections between the humanities and the sciences in order to survey positive cross-fertilizations they produce. Collaborations of unique kinds between the sciences on the one hand, and humanities, art, literature, music, dance, and architecture on the other, mark the current interdisciplinary scene.

Mainstream medical science finds applications of vari-

ous arts in healing, and scientists and medical practitioners seek ethical clarification from philosophers and humanists. Artists evolve rich content, forms, and technique from contemporary science theory and practice. Eco-artists find inspiration and motivation from ecological science and sustainability theory. Postmodern theorists find in scientific theory potential sources of new meta-narratives or fundamental principles that check the radical relativism of contemporary postmodern thought. Engineers and product designers collaborate with artists to produce conceptually beautiful as well as functional objects.

The symposium seeks to survey collaborations that eclipse former antagonisms between the sciences and the humanities and provoke questions about the very nature of each area as they draw from and influence each other.

Co-Chairs: Robert L. Chianese¹ and Carl A. Maida² (¹California State University, Northridge, CA; ²University of California, Los Angeles, CA).

0815 *Welcome and introductions.*

0830 *Natural Selection, Taxonomy and Hierarchy: Casta Painting in 18th Century New Spain*, **BARBARA YABLON MAIDA** (Department of Geography, University of California Los Angeles, Los Angeles, CA).

0900 *Humanistic Science; Scientific Humanism: The Paradox*, **FRED MASSARIK** (University of California, Los Angeles, Anderson School of Management, Los Angeles, CA).

0930 *Physicists and Firewalkers: The Co-construction of Community Identity through Narratives in Ritual Performances*, **JATILA VAN DER VEEN – DAVIS** (Gevirtz Graduate School of Education and Department of Physics University of California, Santa Barbara, Santa Barbara, CA).

1000 **BREAK**

1015 *At the Heart of Learning: How Art, Science, and Social Science are Woven into an Experience-based High School Program*, **ROBERT SHUMER** (University of Minnesota, St. Paul, MN).

1045 *The Hypotenuse: The Pathway of Peace*, **CARLOS E. PUENTE** (Department of Land, Air and Water Resources, University of California, Davis, CA).

1115 *Discussion.*

1200 **LUNCH**

1330 *HIV-Related Stigma and Prospects for Destigmatization*, **CARL A. MAIDA*** and **IAN D. COULTER** (University of California, Los Angeles, Center for the Health Sciences, Los Angeles, CA).

1400 *Clinical Research Ethics – International Protection of*

Human Subjects, **THOMAS GIONIS^{1*} and ERIC HOWARD^{2*}** (¹American Board of Healthcare Law & Medicine, Newport Beach, CA; ²Fulbright Academy of Science & Technology, Cape Elizabeth, ME).

1430 *The “Citizen Ethicist” and the Accreditation of Medical Specialists*, **PATRICK NICHELSON** (Department of Religious Studies, California State University, Northridge, CA).

1500 **BREAK**

1515 *The Impact of Disabling Illness on Creative Works in Later Life*, **DEBRA J. SHEETS¹ and PAMELA B. SCHMIDT^{2*}** (¹Department of Health Sciences, California State University, Northridge, Northridge, CA; ²Bunker Hill Community College, Boston, MA).

1545 *How Much Science in Contemporary Science-Themed and Nature Poetry?* **ROBERT LOUIS CHIANESE** (Department of English, California State University, Northridge, CA).

1615 *Discussion.*

ENVIRONMENTAL and OTHER STUDIES in the GUADALUPE VALLEY

IPJ, Rooms C and D

Monday

8:00 a.m. 4:50 p.m.

Program Organizer: Thomas Kretzschmar (Department of Geology, CICESE, Km 107 Carret, Tijuana–Ensenada, Baja, California, MX).

Sponsored by: Pacific Division Sections on Chemistry; Earth Sciences; Ecology and Environmental Sciences; Engineering and Industrial Sciences; and Social, Economic and Political Sciences.

This symposium is designed to present the latest environmental related topics south of the border to the audience. The presenters are from different universities and research institutes in Baja California, Mexico. The topics to be presented in this session show the wide range of environmental studies carried out in Baja California. They include the work of multidisciplinary workgroups studying carbon flux from terrestrial to marine environments in the Ensenada watersheds and the San Quintin estuaries, catalysators and their environmental implications, and work done in the Guadalupe Valley studying the chemistry, hydrogeology or regional planning.

Chair: Thomas Kretzschmar (Department of Geology, CICESE, Baja California, MX).

- 0800 *Welcome and introductions.*
- 0810 *Towards a Sustainable Operation of the Guadalupe Valley Aquifer*, **A. BADAN¹, T. KRETZSCHMAR¹, I. ESPEJEL², T. CAVAZOS¹, H. d'ACOSTA³, P. VARGAS⁴, L. MENDOZA², C. LEYVA², G. ARAMBURO², W. DAESSLE², and B. AHUMADA²** (¹CICESE, Ensenada, MX, ²Facultad de Ciencias, U.A.B.C., Ensenada, ³Asociación de Vitivinicultores de Baja California, ⁴Secretaría de Desarrollo Urbano y Ecología, Gob. Del Edo. de Baja California, MX).
- 0840 *Regional Planning for the Guadalupe Valley, Baja California, Mexico*, **ILEANA ESPEJEL*, CLAUDIA LEYVA, BRENDA AHUMADA, GUILLERMO ARAMBURO and DAGOBERTO ALVARADO** (School of Sciences, University of Baja California, Ensenada, Baja California, MX).
- 0910 *Hydrogeological Studies for a Sustainable Management of the Guadalupe Aquifer*, **THOMAS KRETZSCHMAR** (Department of Geology, CICESE, Ensenada, Baja California, MX).
- 0940 *Simulation and Optimization of the Guadalupe Valley Aquifer*, **JOSE RUBEN CAMPOS-GAYTAN¹ and THOMAS KRETZSCHMAR²** (¹Departamento de Geofísica Aplicada, Centro de Investigación Científica y de Educación Superior de Ensenada, Ensenada, BC, MX; ²Departamento de Geología, Centro de Investigación Científica y de Educación Superior de Ensenada, Ensenada, BC, MX).
- 1010 **BREAK**
- 1030 *Bulk Soil Erosion and its Potential Significance for Carbon Fluxes in a Mountainous Mediterranean—Climate Watershed*, **S. V. SMITH^{1*}, S. H. BULLOCK¹, A. HINOJOSA-CORONA¹, ERNESTO FRANCO-VIZCAÍNO¹, M. ESCOTO-RODRÍGUEZ¹, T.G. KRETZSCHMAR¹, L. M. FARFÁN², and J. M. SALAZAR-CESEÑA¹** (¹CICESE, Ensenada, Baja California, MX; ²CICESE, La Paz, Baja California Sur, MX).
- 1100 *Multi-scale Beach Erosion in Playas de Rosarito*, **RAMON LIZARRAGA** (HO, UABC).
- 1130 *The San Quintin Coastal Lagoon*, **VICTOR F. CAMACHO-IBAR** (Instituto de Investigaciones Oceanológicas, Universidad Autónoma de Baja California, Ensenada, Baja California, MX).
- 1200 **LUNCH**
- 1330 *Seawater Intrusion and Nitrate Dispersion in the Maneadero Aquifer, Baja California*, **LUIS WALTER DAESSLÉ*, KARINA LUGO-IBARRA, LEOPOLDO MENDOZA-ESPINOSA, VICTOR F. CAMACHO-IBAR** (Instituto de Investigaciones Oceanológicas, Universidad Autónoma de Baja California, Baja California, MX).
- 1400 *Environmental Aspects for the Site Selection of a Desalinization Plant for Ensenada*, **ROGELIO VÁZQUEZ and THOMAS KRETZSCHMAR** (Department of Geophysics, CICESE, Ensenada, Baja California, MX).
- 1430 *Active Faults in Northern Baja California and Paleoseismicity*, **FRANCISCO SUAREZ** (Department of Geology, CICESE, Ensenada, Baja California, MX).
- 1500 **BREAK**
- 1520 *Catalytic Applications of NiWS Nanostructures in Hydrodesulfurization*, **A. OLIVAS¹, S. FUENTES^{1*}, E. FLORES¹, and G. ALONSO²** (¹Centro de Ciencias de la Materia Condensada - UNAM, Ensenada; ²Centro de Investigación en Materiales Avanzados, Chihuahua, MX).
- 1550 *Preparation and Characterization of Au-Zeolite Catalysts for CO Oxidation*, **NINA BOGDAN-CHIKOVA¹, ANDREY SIMAKOV¹, INGA TUZOVSKAYA¹, ALEXEY PESTRYAKOV², MIGUEL AVALOS¹, MARIO FARIAS¹, and E. LIMA³** (¹CCMC-UNAM, Ensenada, B.C., MX; ²Tomsk Polytechnical University, Tomsk, Russia; ³Universidad Autónoma Metropolitana, MX).
- 1620 *Copper-Titania Catalysts for Environmental Protection*, **A. SIMAKOV** (Department of Catalysis, CCMC-UNAM, Ensenada, B.C., MX).

**THE SECOND LAW of THERMODYNAMICS:
FOUNDATIONS and STATUS, Part I**

IPJ, Room 220A

Monday

8:20 a.m. – 4:45 p.m.

continues Tuesday

8:30 a.m. – 11:50 a.m.

Program Organizer: Daniel P. Sheehan (Department of Physics, University of San Diego, San Diego, CA).

Sponsored by the Pacific Division Physics Section.

The second law of thermodynamics is one of the central principles of science, engineering and technology. Since its discovery over 150 years ago by Clausius and Thomson, no counter-example to its universal status has been recognized by the scientific community. Despite this, a number of foundational issues pertaining to it – some dating back more than a century – have yet to be resolved adequately. Several of these are exacerbated by quantum mechanics. Furthermore, in the

last decade over two dozen theoretical challenges to the second law have been advanced into the general scientific literature by research groups around the world. In principle, some of these are amenable to laboratory test.

In this symposium the current theoretical and experimental status of the second law and its foundational issues will be explored. Topics are expected to include Maxwell's celebrated demon (quantum and classical incarnations), decoherence, the thermodynamic arrow of time, and developments in the theory of nonequilibrium systems. Special attention will be paid to ongoing and planned laboratory experiments which address the question of universality. The rich historical and philosophical traditions of the second law will also be considered, since they are inextricably linked to the scientific issues. Brief tours of USD laboratories where second law research is on-going will be offered.

Chair: Daniel P. Sheehan (University of San Diego, San Diego, CA).

0820 *Welcome and Introductions.*

0830 *Using Quantum Mechanics to Resolve the Maxwell Demon Paradox*, **MARLAN O. SCULLY** (Institute for Quantum Studies and Departments of Physics, Chemical and Electrical Engineering, Texas A&M University; Applied Physics Group, Mechanical and Aerospace Department and PRISM, Princeton University, Princeton, NJ).

0915 *Minimum Work Principle and Its Limits for Classical (Non)Ergodic Systems*, **A.E. ALLAHVERDYAN¹ and TH.M. NIEUWENHUIZEN²** (¹Yerevan Physics Institute, Yerevan, Armenia; ²Instituut voor Theoretische Fysica, University of Amsterdam, Amsterdam The Netherlands).

1000 **BREAK**

1020 *Fluctuations of the Random Motion of Diathermal and Adiabatic Pistons*, **BRUNO CROSIGNANI^{1*} and PAOLO DI PORTO²** (^{1,2}Department of Applied Physics, California Institute of Technology, Pasadena, CA; ²Dipartimento di Fisica, Universita' dell'Aquila, L'Aquila, Italy).

1105 *Entropy, Language, and Interpretation*, **HARVEY S. LEFF** (California State Polytechnic University, Pomona, CA, USA).

1150 **LUNCH**

1330 *Explanation of the Gibbs Paradox within the Framework of Quantum Thermodynamics*, **TH.M. NIEUWENHUIZEN** (Instituut voor Theoretische Fysica, University of Amsterdam, Amsterdam, The Netherlands).

1415 *Complexity Theory of Molecular Heat Engines and*

Tightened Versions of the Second Law, **DOMINIK JANZING** (Institut für Algorithmen und Kognitive Systeme, Fakultät für Informatik, Universität Karlsruhe, Karlsruhe, Germany).

1500 **BREAK**

1515 *Information Loss as a Foundational Principle for the Second Law*, **TODD DUNCAN^{1*} and JACK SEMURA^{2*}** (¹Center for Science Education, Portland State University, Portland, OR; ²Department of Physics, Portland State University, Portland, OR).

1600 *An Outline of Caloric Theory of Quantum Systems*, **J.J. MARES, V. SPICKA*, J. SESTAK, P. HUBIK, and J. KRISTOFIK** (Institute of Physics, Academy of Sciences of the Czech Republic).

1645 *What Is Work?* **L. S. SCHULMAN** (Physics Department, Clarkson University, Potsdam, NY).

Continued Tuesday, June 20.

Please refer to page 29.

POSTERS

IPJ, Room B

Monday

9:00 a.m. – 9:30 p.m.

(18) *Thermosynthetic Life*, **DANIEL P. SHEEHAN** (Department of Physics, University of San Diego, San Diego, CA).

(19) *Carnot is Not Universally True*, **KENNETH M. RAUEN** (Palo Alto, CA).

(20) *Critique of Wheeler's "Critique of 'Centrifugal Gas Compression Cycle,'"* **KENNETH M. RAUEN** (Palo Alto, CA).

(21) *The Proell Effect and the Superclassical Heat Engine Cycle*, **KENNETH M. RAUEN** (Palo Alto, CA).

Tuesday, June 20

HALF-DAY SYMPOSIUM

Tuesday Morning

**THE SECOND LAW of THERMODYNAMICS:
FOUNDATIONS and STATUS, Part II**

IPJ, Room 220A

Tuesday

8:30 a.m. – 12:00 p.m.

Continued from Monday, page 28.

Please refer to page 27 for description.

Chair: Daniel P. Sheehan (Department of Physics, University of San Diego, San Diego, CA).

- 0830 *The Second Law and Experiments with Intrinsically-Biased Resonant Microcantilevers*, **DANIEL P. SHEEHAN^{1*}** and **JEFFREY H. WRIGHT²** (¹Department of Physics, ²Department of Mathematics and Computer Science, University of San Diego, San Diego, CA).
- 0915 *Quantum Mechanics and the Second Law of Thermodynamics: Can a Quantum Heat Engine Break the Law?* **PETER D. KEEFE** (University of Detroit, Eastpointe, MI, USA).
- 1000 **BREAK**
- 1020 *Entropy and the Randomizing Effect of Vacuum Radiation*, **JEAN E. BURNS** (San Leandro, CA).
- 1105 *Random Events as Agents of Time's Arrow*, **AVSHALOM C. ELITZUR¹** and **SHAHAR DOLEV²** (¹Bar-Ilan University, Israel; ²Hebrew University, Israel).

HALF-DAY SYMPOSIUM

Tuesday Afternoon

**BRAIN STRUCTURES MEDIATING MEMORY
for PLACE, OBJECT, and EMOTION**

IPJ, Rooms E and F

Tuesday

1:30 p.m. – 5:00 p.m.

Program Organizers: Veronica Galván and Annette Taylor (Department of Psychology, University of San Diego,

San Diego, CA).

Sponsored by the Pacific Division Psychology Section.

Several lines of evidence indicate that there are multiple forms of memory. Generally, these various forms of memory have been classified as belonging to declarative memory (facts and events), or non-declarative memory (procedures, emotions, and priming). Further evidence indicates that different forms of memory are mediated by distinct brain structures. Two subcortical structures, the hippocampus and amygdala, have been investigated extensively regarding their specialized roles in spatial memory and emotional memory, respectively. However, many questions remain about the circumstances under which these structures become active, and the mechanisms of their action. Panelists will discuss recent and original work on these questions, and other topics such as the influence of stress, gender, and brain injury on memory mechanisms.

Co-Chairs: Veronica Galván and Annette Taylor (University of San Diego, San Diego, CA).

- 1330 *Welcome and Introductions.*
- 1335 *Emotional Arousal, Amygdala Activation and Memory*, **BENNO ROOZENDAAL** (Center for the Neurobiology of Learning and Memory and Department of Neurobiology and Behavior, University of California, Irvine, CA).
- 1405 *Sex and Emotional Memory*, **LISA KILPATRICK** (Center for Neurovisceral Sciences and Women's Health, University of California, Los Angeles, Los Angeles, CA).
- 1435 *Immunology and Memory*, **ROBERT E. SIMON** (Mission Viejo, CA).
- 1505 **BREAK**
- 1520 *The Role of the Hippocampus in Recognition Memory*, **NICOLA J. BROADBENT¹**, **LARRY R. SQUIRE^{1,2}**, and **ROBERT E. CLARK^{1,2}** (¹University of California San Diego, La Jolla, CA; ²VA Healthcare System, San Diego, CA).
- 1550 *The Hippocampus and Remote Spatial Memory*, **ROBERT E. CLARK^{1,2}** and **NICOLA J. BROADBENT¹** (¹University of California San Diego, La Jolla, CA; ²VA Healthcare System, San Diego, CA).
- 1620 *Distinct Frames of Reference for the Spatially-Modulated Activity Patterns of Hippocampal and Neocortical Neurons*, **DOUGLAS A. NITZ** (The Neurosciences Institute, San Diego, CA).
- 1650 *General Questions and Answers.*

**FRONTIERS of TIME: REVERSE CAUSATION
EXPERIMENT and THEORY, Part I**

IPJ, Room 220A

Tuesday

1:30 p.m. – 4:55 p.m.

continues on Wednesday

8:30 a.m. – 4:45 p.m.

and Thursday

8:30 a.m. – 4:00 p.m.

Organized by: Daniel P. Sheehan (Department of Physics,
University of San Diego, San Diego, CA).

Sponsored by the Pacific Division Physics Section.

Causality, the notion that earlier events can affect later events but not vice-versa, undergirds our experience of reality and physical law. Causality is predicated on the forward unidirectionality of time. However, most physical laws are time symmetric; that is, they formally and equally admit both time-forward and time-reverse solutions. Time-reverse solutions are distressing because they would allow the future to influence the past, i.e., reverse (retro-) causation. Why time-forward solutions are preferentially observed in nature remains an unresolved problem in physics. (While the most convincing explanations invoke the second law of thermodynamics, wave function collapse or the expansion of the universe, in the end, purely forward causation is an ad-hoc physical assumption.)

Experimental evidence for reverse causation is scarce and open to alternative explanations. The best (and perhaps only) evidence comes from parapsychology, including human psychophysiological responses to future stimuli and mind-matter interactions with random physical systems. While laboratory results are intriguing, theoretical models to explain such outcomes have lagged and those that exist have not yet made deep enough connections with mainstream physics. Even the most basic physical constraints – e.g., whether reverse causation is best explained by energy transfers or simply by correlations without information exchange – remain open questions.

This symposium will explore recent experiments, theory, and philosophical issues connected with reverse causation. In particular, it is hoped that this meeting will help: 1) generate better theoretical models by which established experimental results can be understood; 2) devise new experiments by which the underlying physics may be more clearly exposed; and 3) establish fruitful research collaborations.

Chair: Daniel P. Sheehan (University of San Diego, San Diego, CA).

1330 *Welcome and Introductions.*

1340 *Are Advanced Potentials Anomalous?* **MICHAEL IBISON** (Institute for Advanced Studies, Austin, TX, USA).

1425 *Retrocausal Quantum Measurement: Some New Findings and Their Interpretation,* **AVSHALOM**

C. ELITZUR¹ and SHAHAR DOLEV² (¹Bar-Ilan University, Israel; ²Hebrew University, Israel).

1510 **BREAK**

1525 *Empirical Research on the Radical Subjective Solution of the Measurement Problem. Does Time Get Its Direction Through Conscious Observation?* **DICK J. BIERMAN** (University of Amsterdam, Amsterdam, The Netherlands).

1610 *Encounters at the Frontiers of Time: Questions Raised by Anomalous Human Experiences,* **RICHARD S. BROUGHTON** (Division of Psychology, The University of Northampton, Northampton, UK).

*This session continues on Wednesday.
Please refer to page 36.*

FULL-DAY SYMPOSIA

Tuesday

**MOSQUITOES as VECTORS of DISEASE:
RECENT ADVANCES in BIOLOGY
and CONTROL STRATEGIES**

IPJ, Rooms H and I

Tuesday

8:30 a.m. – 3:00 p.m.

Organized by: Marjorie Patrick (Department of Biology,
University of San Diego, San Diego, CA).

Sponsored by the Pacific Division Sections of Biology and
Health Sciences.

Mosquitoes are considered one of the most lethal organisms in the world due to the fact that they transmit an enormous number of pathogens that have a tremendous and grave impact on the human population. There are many labs studying disease transmission by mosquitoes and are doing so from different perspectives (e.g. pathogen biology, human-pathogen interaction, chemical control agents in the field). This symposium is focused on examining the biology of the mosquito-pathogen interactions and possible control strategies that could disrupt the disease transmission pathway at this stage. Current research in this area must first provide a comprehensive picture of the mosquito and its interaction with the various pathogenic agents (viruses, protozoans, nematodes, bacteria). The above-mentioned researchers have been employing recent molecular techniques (e.g. microarrays, genetic engineering) and information (*Anopheles* genome) to help elucidate the basic biology of the mosquito, the mecha-

nisms underlying mosquito-pathogen interactions, potential mosquito control agents and finally to genetically manipulate the mosquito to augment resistance to the pathogens.

Chair: Marjorie Patrick (University of San Diego, San Diego, CA).

0830 *Welcome and Introductions.*

0835 *Genetic Engineering of Pathogen Resistance in Mosquitoes*, **ZACH N. ADELMAN**^{1,2}, **SEDEF ONAL**¹, **JENNIFER JUHN**¹, **NIJOLE JASINSKIENE**¹, **TODD MACCAULEY**¹, **MICHAEL SALAMPESSY**¹, **AURORA ASHIKYAN**¹, and **ANTHONY A. JAMES**^{1,3*} (¹Department of Molecular Biology and Biochemistry, University of California, Irvine, CA; ²Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, VA; ³Department of Microbiology and Molecular Genetics, University of California, Irvine, CA).

0905 *Genomics of Anopheles gambiae*, **OSVALDO MARINOTTI** (Department of Molecular Biology and Biochemistry, University of California, Irvine, Irvine, CA).

0935 *Transposons and Their Behavior in Mosquitoes: Implications for Gene Drive Strategies*, **PETER W. ATKINSON** (Department of Entomology, University of California Riverside, CA).

1005 **BREAK**

1030 *Recombinant Bacterial Larvicides for Improving Control of Nuisance and Vector Mosquitoes*, **BRIAN A. FEDERICI**^{*}, **HYUN-WOO PARK**, **DENNIS K. BIDESHI**, **MARGARET C. WIRTH**, **JEFFREY J. JOHNSON**, **YUKO SAKANO**, **MUJIN TANG** and **WILLIAM E. WALTON** (Department of Entomology and Interdepartmental Graduate Programs in Genetics and Microbiology, University of California, Riverside, Riverside, CA).

1100 *Development of Gene Drive Systems in Mosquitoes*, **JENNIFER JUHN**^{*} and **A.A. JAMES** (University of California, Irvine, Irvine, CA).

1130 *Aedes aegypti NHE8 Mediates Electroneutral Na⁺/H⁺ Exchange across Malpighian Tubule Apical Membrane and Catalyzes Na⁺ and K⁺ Transport in Reconstituted Vesicles*, **WANYOIKE W. KANG'ETHE**¹, **KARLYGASH G. AIMOVA**², **ASHOK K. PULLIKUTH**³, and **SARJEET S. GILL**^{1,2} (¹Graduate Program in Environmental Toxicology, ²Department of Cell Biology and Neuroscience, University of California, Riverside, CA; ³Department of Pharmacology and Experimental Therapeutics, Louisiana State University Health Sciences Centre, New Orleans, LA).

1200 **LUNCH**

1330 *Mechanism of Toxin Action*, **SARJEET S. GILL** (Department of Cell Biology and Neuroscience, University of California, Riverside, CA).

1400 *Characterization of a Blood Meal Responsive Amino Acid Transporter in the Disease Vector, Aedes aegypti*, **A.M. EVANS**^{*}, **L.S. ROSS**, and **S.S. GILL** (Department of Cell Biology and Neuroscience, University of California, Riverside, CA).

1430 *Ecdysone Agonists: A New Class of Insect Growth Regulators as Mosquito Biopesticides*, **NANCY BECKAGE**^{*}, **RICKY MAI**, and **KRISTINA DILL** (Departments of Entomology & Cell Biology and Neuroscience, University of California-Riverside, Riverside, CA).

Wednesday, June 21

HALF-DAY SYMPOSIA

Wednesday Morning

**CADILLAC DESERT REVISITED:
NEW MULTIDISCIPLINARY TRENDS
in URBAN WATER RESEARCH and
PRACTICAL APPLICATIONS**

IPJ, Rooms H and I

Wednesday

8:00 a.m. – 12:00 p.m.

Organized by: Suzanne M. Michel (Department of Marine and Environmental Studies, University of San Diego, San Diego, CA).

Sponsored by the Pacific Division Sections on Ecology and Environmental Sciences and Social, Economic and Political Sciences.

The history of Southern California urban water has been extensively documented by historians and environmental journalists, and has garnered attention in films such as *Chinatown* (1974) and *Cadillac Desert* (1997). However these narratives of urban water are dated, given the extensive research conducted over the past decade in water conservation, fluvial geomorphology, geographic information systems, water quality, wetlands science and hydrology. This symposium will examine new advances in scientific urban water research in Southern and Baja California. Speakers will cover different categories of urban water: wastewater, storm water, groundwater, imported water, water for ecosystems,

coastal water and drinking water. Research topics such as the watershed approach, sediment load models, water metering, desalination, environmental security and impervious surfaces will be discussed. Urban water research in Southern/Baja California reflects a growing interest in not only the field of water resources management, but also sustainable cities, smart growth, urban river restoration, and environmental justice.

Moderator: Conner Everts (Southern California Watershed Alliance).

0800 *Welcome and Introductions.*

0805 *An Approach to Pricing Municipal Water in Drought-Prone Cities of Southern California and Elsewhere*, **HUGO A. LOÁICIGA** (Department of Geography, University of California at Santa Barbara, Santa Barbara, CA).

0825 *Smart Irrigation Controllers Save Water; Reduce Runoff and Pollution - What Next?* **JOE BERG** (Water Use Efficiency Programs Manager, Municipal Water District of Orange County, Fountain Valley, CA).

0845 *Los Angeles Basin Water Augmentation Study: Rethinking Urban Runoff*, **SUZANNE DALLMAN^{1*} and THOMAS W. CHESNUTT²** (¹Technical Director, Los Angeles and San Gabriel Rivers Watershed Council, Los Angeles, CA; ²A&N Technical Services, Encinitas, CA).

0905 *Discussion*

0950 **BREAK**

1010 *Desalination: Promoting Urban Growth in Baja California?* **KAYA FREEMAN** (Central California Regional Manager, Surf Rider Foundation, San Clemente, CA).

1030 *Urban Runoff and Sedimentation Study of the Los Peñasquitos Watershed*, **MIKE HASTINGS** (Executive Director, Los Peñasquitos Lagoon Foundation, Cardiff by the Sea, CA).

1050 *Triple Border Fence Initiative: United States Border Security or Violation of the Public Trust for Wetlands?* **SUZANNE MICHEL** (Department of Marine Science and Environmental Studies, University of San Diego, San Diego, CA).

1110 *Discussion*

MATERIALS SCIENCE and NANOPARTICLES II

IPJ, Room 217

Wednesday

9:30 a.m. – 12:00 p.m.

Organized by: Panos Photinos, Sidney C. Abrahams and George Quainoo (Department of Physics and Engineering, Southern Oregon University, Ashland, OR). Sponsored by the Pacific Division Sections of Chemistry, Engineering and Industrial Sciences, and Physics.

This symposium is a continuation from last year's meeting in Ashland, OR. It is designed as an opportunity for educators, researchers and their students to present their current work to an interested and knowledgeable audience. Topics are intended to cover the synthesis, characterization and applications of novel smart materials, including such things as:

- Biomaterials
- Ferroelectrics
- Liquid crystals and complex fluids
- Nanomaterials
- Polymers
- Thin films and coatings

IMPORTANT NOTE: This symposium meets after the deadline for judging student papers. Students presenting in this symposium and wishing to have their work judged for an Award of Excellence must present their work as a poster, where it will be judged.

Chair: Panos Photinos (Southern Oregon University, Ashland, OR).

0925 *Welcome and Introductions.*

0930 *Phosphate Ester Hydrolysis Promoted by Water-soluble Metal Complexes*, **HONG-CHANG LIANG*, MARCEL HETU, BINDIA SHETTY, and WEN-LUNG CHANG** (Department of Chemistry and Biochemistry, San Diego State University, San Diego, CA).

0945

Paper Withdrawn

1000 *Metal-Polymer and Metal-Ceramic Colloidal Building Blocks for 3D Photonic Crystals*, **ISA D. WATSON^{1*}, IAN HOSEIN², STEPHANIE LEE², and C.M. LIDDELL²** (¹Department of Chemistry, Hampton University, Hampton, VA; ²Department of Materials Science and Engineering, Cornell University, Ithaca, NY).

1015 **BREAK**

1030 *Prediction and Experimental Verification of Two New Ferroelectrics*, **J. E. MATTHEWS***, **M. ANDRUS**, **P. WU**, **P. PHOTINOS** AND **S. C. ABRAHAMS** (Physics Department, Southern Oregon University, Ashland, OR).

1045 *Effects of Controlled Oxidation and Reduction of Carbon Nanotubes*, **BRETT R. GOLDSMITH***, **YUWEI FAN**, **ALEX KANE** and **PHILIP G. COLLINS** (Department of Physics and Astronomy, University of California at Irvine, Irvine, CA).

1100 *High Temperature Conductivity and Reactivity of Carbon Nanotube Electronic Circuits*, **ALEXANDER A. KANE*** and **PHILIP G. COLLINS** (Department of Physics and Astronomy, University of California at Irvine, Irvine, CA).

1115 *Carbon Nanotube Based “Electronic Nose” For Detection Of Aliphatic Hydrocarbons*, **SHALINI PRASAD*** and **SUDHAPRASANNA KUMAR PADIGI** (Department of Electrical Engineering, Portland State University, Portland, OR).

1130 *Polymer Micro-Cylindrical Waveguide Based Protein Biosensor*, **SHALINI PRASAD^{1*}**, **SUDHAPRASANNA KUMAR PADIGI¹**, **KOFI KASANTTE²**, **RAVI KIRAN KONDAMA REDDY¹**, **VIJAY SEK HAR REDDY KOVVURI¹** and **ANDRES LA ROSA²** (¹Department of Electrical Engineering, Portland State University, Portland, OR; ²Department of Physics, Portland State University, Portland, OR).

1145 *Nano Monitors for Identification of Vulnerable Cardio-Vascular Plaque*, **RAVI K. REDDY^{1*}**, **SHALINI PRASAD¹**, **THOMAS W. BARRETT²**, **CORY BYSTROM³**, and **JOHN R. CARRUTHERS⁴** (¹Department of Electrical and Computer Engineering, Portland State University, Portland, OR; ²Internal, Hospital and Perioperative Medicine, Portland Vamc, Oregon Health Sciences University, Portland, OR; ³Proteomics Shared Resource, Oregon Health Sciences University, Portland, OR; ⁴Department Of Physics, Portland State University, Portland, OR).

POSTERS

IPJ, Room B

Monday

9:00 a.m. – 9:30 p.m.

(15) *Effects of Controlled Oxidation and Reduction of Carbon Nanotubes*, **BRETT R. GOLDSMITH***, **YUWEI FAN**, **ALEX KANE** and **PHILIP G. COLLINS** (Department of Physics and Astronomy, University of California at Irvine, Irvine, CA).

(16) *High Temperature Conductivity and Reactivity of Carbon Nanotube Electronic Circuits*, **ALEXAN-**

DER A. KANE* and **PHILIP G. COLLINS** (Department of Physics and Astronomy, University of California at Irvine, Irvine, CA).

(17) *Nano Monitors for Identification of Vulnerable Cardio-Vascular Plaque*, **RAVI K. REDDY^{1*}**, **SHALINI PRASAD¹**, **THOMAS W. BARRETT²**, **CORY BYSTROM³**, and **JOHN R. CARRUTHERS⁴** (¹Department of Electrical and Computer Engineering, Portland State University, Portland, OR; ²Internal, Hospital And Perioperative Medicine, Portland Vamc, Oregon Health Sciences University, Portland, OR; ³Proteomics Shared Resource, Oregon Health Sciences University, Portland, OR; ⁴Department Of Physics, Portland State University, Portland, OR).

HALF-DAY SYMPOSIA

Wednesday Afternoon

HETEROGENEITY of INDIVIDUAL TYPES ACROSS BOUNDARIES of SPECIES, CULTURES AND GENDER

IPJ, Room 217

Wednesday

1:30 p.m. – 3:30 p.m.

Program organizer: Magoroh Maruyama (Interactive Heterogenistics, San Diego, CA)

Sponsored by the Pacific Division General and Interdisciplinary and Psychology Sections.

Social Sciences, psychology, primatology and neuroscience are converging to confirm that individual cognitive types and personality types are common across boundaries between species, between gender, and between cultures. In other words, each individual type can be found in all species, in all cultures, and in both genders. This is abbreviated as HTICT (heterogeneity and transgroup nature of individual cognitive/cogitative/action types). Beneath the surface of culturally ritualized, socially conditioned learned standardized stereotypical behavior, inborn phenotypic HTICT exists in camouflaged or disguised forms.

In social and biological sciences, the prevalent methodology has been to compare groups in terms of statistical means (averages) and standard deviations (spread), which made the individual types invisible. Most of the researchers forgot or never learned that the normal (Gaussian) distribution (the bell-shaped curve) occurs if the events are random and independent, such as tossing a coin many times and counting the number of heads and tails. However, social and biological events are neither random nor independent, and therefore it is

illogical to assume normal distribution. It is more appropriate to use a new methodology “heterogram analysis” to discover transgroup individual types as clusters in the raw score space. Any researcher can re-analyze his/her data using this new methodology.

Chair: Magoroh Maruyama (San Diego, CA)

- 1330 *Turning the Mainstream Current*, **MAGOROH MARUYAMA** (Interactive Heterogenetics, San Diego, CA).
 1355 *Individually Different Brain Responses*, **MANFRED FAHLE** (Universitaet Bremen, Bremen, Germany).
 1420 *Personality Dimensions in Chimpanzees*, **JAMES E. KING** (Department of Psychology, University of Arizona, Tucson, AZ).
 1445 *Heterogram Analysis As Cross-Cultural Analysis Method*, **ALVIN HWANG** (Pace University, New York, NY).
 1510 *Discussion*.

- entrepreneurship, innovations, and connections between local academic institutions and industry
- recent shifts in funding preferences by venture capital groups
- local stem cell research and ethical issues surrounding the work
- workforce issues
- preparing students for careers in the local biotech and pharmaceutical industries

Chair: Debbie Tahmassebi (University of San Diego, San Diego, CA).

- 0900 *Opening Remarks*, Debbie Tahmassebi.
 0910 *A Novel Evolutionary Solution for Generating Binding Diversity, and Its Applications*, **PARTHO GHOSH** (Department of Chemistry and Biochemistry and Section of Molecular Biology, University of California, San Diego, La Jolla, CA).
 0945 *Technology Transfer, Entrepreneurism, Skilled Workers, and Finance the Ingredients of Starting Technology Businesses*, **DUANE ROTH** (CONNECT, La Jolla, CA).

1020 **BREAK**

- 1040 *Ethical and Policy Complexities in Current Embryonic Stem Cell Research*, **T. FRIEDMANN** (University of California San Diego School of Medicine, La Jolla, CA).
 1115 *Creating Value Through Structure-Based Drug Discovery*, **KEITH WILSON** (Takeda San Diego, San Diego, CA).

1150 **LUNCH**

- 1330 *Building a Biotech Company Through Licensing*, **WENDY JOHNSON** (ProQuest Investments, San Diego, CA).
 1405 *Education's Role in Biotech Success*, **GAIL NAUGHTON** (Dean, College of Business Administration, San Diego State University, San Diego, CA).
 1440 *Academic Technology Transfer: A model for University-Industry Partnership*, **ALAN PAAU** (University of California, San Diego Technology Transfer and Intellectual Property Services, La Jolla, CA).

1515 **BREAK**

- 1530 *Intellectual Property Issues Facing Startup Companies*, **SAM TAHMASSEBI** (Vista IP Law Group, Irvine, CA).
 1605 *Novel Approaches That Accelerate and Enhance Drug Discovery*, **RICHARD A. HOUGHTEN** (Torrey Pines Institute for Molecular Studies, San Diego, CA).

FULL-DAY SYMPOSIA

Wednesday

THE SAN DIEGO BIOTECH and PHARMACEUTICAL INDUSTRY: TECHNOLOGY, FUNDING, ETHICS, and the PREPARATION of STUDENTS

IPJ, Room B

Wednesday

9:00 a.m. – 5:15 p.m.

Organized by: Debbie Tahmassebi (Department of Chemistry and Biochemistry, University of San Diego, San Diego, CA).

Sponsored by the Pacific Division Sections of Biology, Chemistry, and Health Sciences.

The focus of this symposium is the San Diego biotech and pharmaceutical industries, and is relevant to all people attending the meeting including students considering careers in biotech/biopharma, technical Ph.D.'s interested in being more business savvy, faculty at academic institutions interested in developing industrial connections, and all those interested in an overview of the current state of the biotech and pharmaceutical industries in San Diego.

Speakers will address many exciting topics including:

- recent exciting technologies developed in academic institutions and industry

1640 *Immigration, Science Education and the Battle for the Best and Brightest*, **MARK CAFFERTY** (Vice President and COO, San Diego Workforce Partnership, San Diego, CA).

**ECOLOGICAL MONITORING of VENICE
and ITS LAGOON in a TIME of TRANSITION**

IPJ, Rooms C and D

Wednesday

8:15 a.m. – 5:00 p.m.

Organized by: Alberto Zirino (Scripps Institution of Oceanography, La Jolla, CA).

Sponsored by the Pacific Division Sections on Atmospheric and Oceanographic Sciences, Biology, Chemistry, Earth Sciences, and Ecology and Environmental Sciences.

The Venice Lagoon and the historical city of Venice are under severe threat from the yearly storm surges that flood the city and undermine its buildings. Recently, the Italian government, via its concessionary, the Consorzio Venezia Nuova, has undertaken the construction of movable dikes (paratoie mobili) at the three entrances to the lagoon to protect it from the flooding. These dikes may close off the lagoon from the Adriatic Sea for periods of 12 to (possibly) 100 days, according to various global warming scenarios. This symposium presents current studies aimed at gaining an understanding of the fundamental processes that affect the lagoon ecosystem to better assess possible ecological changes that may occur in the lagoon under different future scenarios.

Chair: Alberto Zirino (Scripps Institution for Oceanography, La Jolla, CA).

0815 *Welcome, Introductions and Acknowledgments*.

0820 *Physical Setting and Physical Forcing of the Venice Lagoon*, **ALBERTO ZIRINO** (Scripps Institution of Oceanography, MC 02020, La Jolla, CA; Consorzio Venezia Nuova, Venezia, Italy; University of San Diego, San Diego, CA).

0840 *Subsidence of the Venice Lagoon from Continuous GPS and InSAR Permanent Scatterers*, **YEHUDA BOCK**,¹ **SHIMON WDOWINSKI**,² **ALESSANDRO FERRETTI**,³ **GIOVANNI CECCONI**,⁴ and **GIULIANO SAVIO**³ (¹Cecil H. and Ida M. Green Institute of Geophysics and Planetary Physics, Scripps Institution of Oceanography, La Jolla, CA; ²Division of Marine Geology and Geophysics, University of Miami, Miami, FL; ³Tele-Rilevamento Europa – T.R.E., Milano, Italy; ⁴Consorzio Venezia

Nuova, Venezia, Italy).

0900 *An Efficient, Semi-Implicit Finite Element Model to Simulate Tidal Propagation and Solute Dispersion in the Venice Lagoon*, **ANDREA GARZON** (CREA, S.r.l., Verona, Italy).

0920 *Water Quality: Trends and Patterns of Macro and Microvariables*, **STEFANO CIAVATTA**¹, **GIANPIERO COSSARINI**², **DONATA MELAKU CANU**², **ANTONIO PETRIZZO**¹, **COSIMO SOLIDORO**², and **ROBERTO PASTRES**¹ (¹Department of Physical-Chemistry, University of Venice, Venice, Italy; ²Istituto Nazionale di Oceanografia e di Geofisica Sperimentale OGS, Sgonico, Italy).

0940 *New Challenges in Environmental Quality Assessment: The SIOSED Project as a Case Study in the Venice Lagoon, Italy*, **DIMITRI D. DEHEYN**¹ and **CRISTINA NASCI**² (¹Scripps Institution of Oceanography, University of California at San Diego, La Jolla, CA; ²Thetis S.p.A., Environmental Studies and Analyses Division, Venice, Italy).

1000 *Physical Oceanographic Measurements in Venice Lagoon and Their Influence on Turbidity*, **F.G. MARVAN**, **W. BOYD** and **M. HANY. S. ELWANY** (Scripps Institution of Oceanography, La Jolla, CA).

1020 **BREAK**

1040 *Phytoplankton and Microphytobenthos in the Venice Lagoon: Comparisons of Abundance, Taxonomic Composition, and Productivity*, **FACCA C.**¹, **BAZZONI A.M.**¹, **COPPOLA J.**¹, **HEWES C.**², **HOLM HANSEN O.**², and **SOCAL G.**¹ (¹Institute of Marine Science (ISMAR CNR), Venice, Italy; ²Scripps Institution of Oceanography La Jolla, CA).

1100 *Copper Complexation Capacity in Surface Waters of the Venice Lagoon*, **F. DELGADILLO-HINOJOSA**^{1,2}, **C. NASCI**³, and **A. ZIRINO**^{2,4} (¹Institute of Oceanographic Research, University of Baja California, Ensenada, B.C., MX; ²Scripps Institution of Oceanography, La Jolla, CA; ³Thetis S.p.A., Environmental Studies and Analyses Division, Venice, Italy; ⁴Consorzio Venezia Nuova, Venezia, Italy).

1120 *Levels of Hepatitis A Virus and Enterovirus in the Lagoon Canals and Lido Beach of Venice, Italy*, **RICHARD M. GERSBERG**¹, **MICHAEL A. ROSE**¹, **ARUN K. DHAR**², **HILARY A. BROOKS**¹, and **FULVIO ZECCHINI**³ (¹Graduate School of Public Health, San Diego State University, San Diego, CA; ²Department of Biology, San Diego State University, San Diego, CA; ³Laboratorio di Analisi di Microbiologia Ambientale (L.A.M.A.), Consorzio Interuniversitario Nazionale “La Chimica per l’Ambiente” (I.N.C.A.) Via delle Industrie, Venezia, Italy).

1140 *Culture-Based and Nucleic-Acid Based Monitoring*

of Pathogen Levels in the Sediments of the Venice Lagoon, **DOUGLAS H. BARTLETT** and **LEENA PALEKAR** (Scripps Institution of Oceanography, La Jolla, CA).

- 1200 *Pore Fluid Studies of Sediments from Venice Lagoon: Importance for Ecological Studies of SIOSED*, **JORIS M. GIESKES¹**, **SEUNGHEE HAN¹**, and **ANTHONY RATHBURN^{1,2}** (¹Scripps Institution of Oceanography, University of California at San Diego, La Jolla, CA; ²Geography, Geology, and Anthropology, Indiana State University, Terre Haute, IN).

1220 **LUNCH**

- 1340 *Evidences of Biogeochemical Factors Affecting Mercury Methylation in Sediments of the Venice Lagoon, Italy*, **SEUNGHEE HAN¹**, **PATRIZIA PRETTO^{1,2}**, **ANNA OBRAZTSOVA¹**, **JORIS GIESKES¹**, and **BRADLEY M. TEBO¹** (¹Scripps Institution of Oceanography, La Jolla, CA; ²University of Padova, Padova (VE), Italy).

- 1400 *Biomarkers of Toxicant Exposure: Roles of Metallothioneins in Metal Detoxification and Homeostasis*, **A.Z. MASON** (Department of Biological Sciences and Institute for Integrated Research in Materials, Environments and Society, California State University, Long Beach, CA).

- 1420 *An Integrated Biomarker-Based Strategy for Ecotoxicological Evaluation of the Venice Lagoon*, **CRISTINA NASCI¹**, **EUGENIA DELANEY¹**, **ANDREA BARBANTI¹**, **ANDREA BERTON¹**, **ALBERTO G. BERNSTEIN²**, **CHIARA CASTELLANI¹** and **LAURA MONTOBBIO²** (¹Thetis S.p.A., Environmental Studies and Analyses Division, Venice, Italy; ²Consorzio Venezia Nuova, Environmental Department, Venice, Italy).

- 1440 *Sediment Quality Assessment in the Venice Lagoon: a Triad Approach*, **DELANEY E.¹**, **BARBANTIA I.¹**, **BERNSTEIN A.G.²**, **BERTON A.¹**, **DA ROS L.³**, **MONTOBBIO L.²**, **NASCI C.¹**, **PICONE M.⁵**, and **VENIER P.⁴** (¹Thetis S.p.A. - Environmental Studies and Analysis Division, Venice, Italy; ²Consorzio Venezia Nuova, Environmental Department, Venice, Italy; ³National Research Council, Institute of Marine Science, Venice, Italy; ⁴University of Padua, Biology Department, Padua, Italy; ⁵University Ca' Foscari of Venice, Department of Environmental Sciences, Venice, Italy).

1500 **BREAK**

- 1520 *Ecological and Geochemical Responses of Living (Stained) Benthic Foraminifera to Contamination Gradients in the Venice Lagoon, Italy*, **A. RATH-**

BURN^{1,2}, **M. E. PEREZ¹**, **J. KLUESNER¹**, **C. BASAK¹**, **C. GRAY¹**, **E. BROUILLETTE¹**, and **J. GIESKES²** (¹Geography, Geology, and Anthropology, Indiana State University, Terre Haute, IN; ²Scripps Institution of Oceanography, University of California, San Diego, La Jolla, CA).

- 1540 *Microbial Biodiversity in Surficial Anoxic Sediments of the Venice Lagoon*, **FRANCO BALDI¹**, **SARA BORIN²**, **LORENZO BRUSETTI²**, and **DANIELE DAFFONCHIO²** (¹Departement of Environmental Science, Cà Foscari University, Venezia, Italy; ²Dipartimento di Scienze e Tecnologie Alimentari e Microbiologiche, sez. Microbiologia Agraria Alimentare ed Ecologica (DISTAM), Università degli Studi di Milano, Milano, Italy).

- 1600 *Microbial Aspects of Sediment Transport*, **FAROOQ AZAM¹**, **FRANCESCA MALFATTI¹**, **JOHNNY NGUYEN¹**, **PAOLA DE NEGRO²**, and **CHIARA LARATO²** (¹Scripps Institution of Oceanography, UCSD, La Jolla, CA; ²Marine Biological Laboratory, Trieste, Italy).

- 1620 *Trophic Structure and Ecological Recovery of Venice Lagoon Restored and Natural Salt Marshes: A Stable Isotope Approach*, **C. WHITCRAFT***, **L. LEVIN**, **P. MCMILLAN**, **G. MENDOZA**, and **J. GONZALEZ** (Scripps Institution of Oceanography, La Jolla, CA).

- 1640 *Seagrass Distribution in Venice Lagoon: Spatial-Temporal Dynamics as a Result of Physical Pressures and Disturbance Factors*, **ANDREA RISMONDO**, **DANIELE CURIEL**, and **FRANCESCO SCARTON** (SELC Soc. coop., Venezia-Marghera, Italy).

FRONTIERS of TIME: REVERSE CAUSATION EXPERIMENT and THEORY, Part II

IPJ, Room 220A

Wednesday

8:30 a.m. – 4:45 p.m.

continues on Thursday

8:30 a.m. – 4:00 p.m.

Continued from Tuesday afternoon, page 30. Please refer to page 30 for description.

Chair: Daniel P. Sheehan (University of San Diego, San Diego, CA).

- 0830 *Purported Causal Anomalies within a Quantum-Theoretic Context*, **HENRY STAPP** (Lawrence Berkeley National Lab).

- 0915 *Reverse Causation and the Transactional Interpretation of Quantum Mechanics*, **JOHN G. CRAMER** (Depart-

ment of Physics, University of Washington, Seattle, WA).

1000 **BREAK**

1020 *Psychophysiological Tests of Possible Retrocausal Effects in Humans*, **DEAN RADIN** (Institute of Noetic Sciences, Petaluma, CA 94952; E-mail: deanradin@noetic.org).

1105 *Lagrangian Interpretation of Radin Markov-Chain Experiments*, **DANIEL P. SHEEHAN** (Department of Physics, University of San Diego, San Diego, CA).

1150 **LUNCH**

1330 *Anomalous Anticipatory Responses in Networked Random Data*, **ROGER NELSON** (Global Consciousness Project, Princeton, NJ).

1415 *Retrocausal Information Flow: What are the Implications of Knowing the Future?* **YORK DOBYNS** (Princeton Engineering Anomalies Research, Princeton University, Princeton, NJ).

1500 **BREAK**

1515 *Does the Action of the Mind Take Place at the Molecular Level?* **JEAN E. BURNS** (San Leandro, CA).

1600 *Constraints Imposed on Retrocausation by Entropy and Information Considerations*, **GARRET MODEL** (Department of Electrical and Computer Engineering, University of Colorado, Boulder, CO).

*This symposium continues on Thursday.
Please refer to the next column.*

Thursday, June 22

ALL-DAY SYMPOSIA

Thursday

FRONTIERS of TIME: REVERSE CAUSATION EXPERIMENT and THEORY, Part III

IPJ, Room 220A

Thursday

8:30 a.m. – 4:00 p.m.

*Continued from Wednesday, page 37.
Please refer to page 30 for description.*

Chair: Daniel P. Sheehan (University of San Diego, San Diego, CA).

0830 *Schrödinger Equation for Joint Bidirectional Evolution in Time*, **GERHARD E. HAHNE** (Sunnyvale, CA).

0915 *From the Dynamics of Coupled Map Lattices to the Psychological Arrow of Time*, **HARALD ATMANS-PACHER** (Institut für Grenzgebiete der Psychologie und Psychohygiene e.V., Department of Theory and Data Analysis, Freiburg, Germany).

1000 **BREAK**

1020 *Self-organization of Temporal Structures - A Possible Solution for the Intervention Problem*, **WALTER VON LUCADOU** (WGFP, Freiburg, Germany).

1105 *The Speed of Thought: Investigation of a Complex Space-Time Metric*, **ELIZABETH RAUSCHER¹ and RUSSELL TARG²** (¹Tecnic Research Laboratory, Apache Junction, AZ; ²Bay Research Institute, Palo Alto, CA).

1150 **LUNCH**

1330 *Time-reversed Causation or Extant Indefinite Reality?* **JOOP M. HOUTKOOPER** (Centre for Psychobiology and Behavioral Medicine at the Justus-Liebig-University of Giessen, Giessen, Germany).

1415 *Physics without Causality: Theory and Evidence*, **RICHARD SHOUP* and THOMAS ETTER** (Boundary Institute, Los Altos, CA).

1500 **BREAK**

1515 *Discussion/Roundtable*

notes

II. WORKSHOPS

Saturday, June 17

**TEACHING SCIENTIFIC LITERACY and
CRITICAL THINKING ACROSS DISCIPLINES:
HANDS-ON WORKSHOP for TEACHERS of
HIGH SCHOOL, COMMUNITY COLLEGE
and UNIVERSITY STUDENTS**

IPJ, Rooms C and D

Saturday

9:00 a.m. – 4:00 p.m.

Program Organizer: Annette Taylor (Department of Psychology, University of San Diego, San Diego, CA).

Sponsored by the Pacific Division Section on Education.

Current and future teachers across all levels of instruction, and across all disciplines of science are invited to join us for a day of sharing ideas and learning new strategies and techniques for the classroom. The program includes presentations by established leaders in science education, as well as hands-on workshops with skills you can take into the classroom.

Workshop participants were asked to pre-register for this session. On-site registration will be available Saturday morning. Those registering for the full AAAS Pacific Division meeting may attend this session at no additional charge. The fee schedule for those attending only this session is K – 14 teacher or graduate student preparing to teach K – 14, \$20.00; all others, \$30.00.

**0900 – 0950 Opening Remarks and
Keynote Address**

All Attendees

Teaching General Thinking/Scientific Literacy Skills Applicable Across A Wide Variety of Subjects and Contexts That Generalize Across Domains and Last Long into the Future, **DIANE F. HALPERN** (Professor and Chair of Psychology, Claremont McKenna College, Claremont, CA).

1000 – 1050 Concurrent Workshops

Choose A or B

Workshop A: *Back of the Envelope*, **DANIEL P. SHEEHAN** (Department of Physics, University of San Diego, San Diego, CA).

Workshop B: *Why Study (or Teach) Psychology?* **KAREN**

HUFFMAN (Psychology Department, Palomar College, 140 West Mission Road, San Marcos, CA).

11:00 – 1150 Concurrent Workshops

Choose C or D

Workshop C: *Using Student Led Discussions of Scientific Articles*, **MARYSUE LOWERY** (Department of Biology, University of San Diego, San Diego, CA).

Workshop D: *Teaching Tips Exchange Session: Teaching Critical Thinking*, **JERRY RUDMANN¹ and ANN EWING²** (¹Department of Psychology, Irvine Valley College, Irvine, CA; ²Department of Psychology, Mesa College, Mesa, AZ).

1200 – 1310 Lunch on your own

(see suggestions handout)

1315 – 1405 Concurrent Workshops

Choose E or F

Workshop E: *Secrets of the Platonic Solids: The Ancient Greeks Knew Them and We Can Too!* **PERLA MYERS** (Department of Mathematics, University of San Diego, San Diego, CA).

Workshop F: *Use of Refutational Text and Lecture in Conceptual Change and Dispelling Misconceptions Across Disciplines*, **PATRICIA KOWALSKI and ANNETTE TAYLOR** (Department of Psychology, University of San Diego, San Diego, CA).

1415 – 1505 Closing Remarks and Address

All Attendees

Using Children's Literature To Develop Critical Thinking Skills, **SANDY BUCZYNSKI** (School of Leadership and Educational Sciences, University of San Diego, San Diego, CA).

Workshop descriptions continue on next page.

Tuesday, June 20

**COLLABORATIVE LESSON STUDY:
ENHANCING the QUALITY of TEACHING
SCIENCE through PRACTICE**

IPJ, Rooms E and F

Tuesday

10:00 a.m. – 12:00 p.m.

Program co-organized by: Marisa Ramirez¹, Jill Brownlee², and Kim Bess³ (¹Science Resource Teacher, Elementary, San Diego City Schools, San Diego, CA; ²Science Resource Teacher, Secondary, San Diego City Schools, San Diego, CA; ³Director of Science, San Diego City Schools, San Diego, CA).

Sponsored by the Pacific Division Section on Education.

Collaborative Lesson Study is a collegial mentoring process designed to improve teacher quality by focusing on lesson study. Collaborative Lesson Study provides opportunities for professional dialogue and critical reflection based on planning and teaching a lesson, examining student work, and refining lessons based on student outcome. Collaborative Lesson Study is adapted from the WestEd version of the Teaching and Learning Collaborative to the needs of a large-scale professional development effort for the teaching and learning of science, grades K-12, in San Diego City Schools, an urban school district of 180,000 students.

Participants of this session will develop an awareness of the Collaborative Lesson Study protocol through examining student work, video and dialogue. The Collaborative Lesson Study process focuses on the cause and effect of lesson design and decisions by a collaborative of teachers as evidenced in student understanding. The CLS process builds trusts and lays the foundation for collegial work, joining veteran and new teachers with the goal of continuous improvement.

The CLS protocol is based on the use of the 5E Lesson Design inquiry model, analyzing the conceptual flow of a learning sequence, and engaging students in discourse and writing to communicate their conceptual understanding of the content and ability to develop and utilize science process skills.

Wednesday, June 21

MOLECULAR BIOLOGY KITS

SHILEY, Room 330

Wednesday

8:30 a.m. – 4:00 p.m.

continues on Thursday

9:00 a.m. – 3:30 p.m.

Sponsored by the Pacific Division Section on Education.

Bio-Rad Corporation of Hercules, CA, will be presenting several hands-on workshops to give middle school, high school and university instructors the opportunity to try out some of the molecular biology kits they offer to educators. Bio-Rad representatives will provide certificates of attendance for those desiring to utilize these workshops for professional development credits.

More information about these and other Bio-Rad kits can be found on the internet at explorer.bio-rad.com.

Those wishing to participate in one or several of these workshops were asked to preregister for them. Participation is limited to 24 in a session. If you wish to attend a session but did not preregister, please check for availability at the Registration Desk.

There is no additional charge for those registered for the entire meeting. For those coming just for these Bio-Rad workshops, there is a \$20.00 “Bio-Rad only” registration fee, which covers participation in all five sessions. Please wear your name badge to the workshops.

8:30 a.m. – 10:00 a.m. Bio-Rad Genes in a Bottle™ Kit

Can you see your DNA?

Enable your students to visualize and comprehend their DNA, the normally invisible substance of life. With this kit, students extract genomic DNA from their own cheek cells, then precipitate and capture it in a fabulously cool necklace.

10:30 a.m. – 12:00 p.m. Bio-Rad ELISA Immuno Explorer Kit

Biology's magic bullet?

Simulate the outbreak of a disease in your classroom and use real antibodies to track it. Teach your students how diseases (HIV) and markers of cancer, pregnancy, or drug use are diagnosed.

1:30 p.m. – 4:00 p.m. Bio-Rad PV92 PCR Informatics Kit

What genes are you wearing?

Fingerprint your own DNA using forensic DNA extraction techniques, PCR amplification and electro-

phoresis. Using their actual kit results, this kit allows your students to test the Hardy-Weinberg equilibrium theory within their own classroom population, then go online to compare classroom results to population data worldwide. AP LAB 8

BioRad workshops continue on Thursday.

Thursday, June 22

MOLECULAR BIOLOGY KITS

SHILEY, Room 330

Thursday

9:00 a.m. – 3:30 p.m.

Continued from Wednesday.

*Please refer to description on page xx
for important information.*

9:00 a.m. – 11:30 a.m. Bio-Rad GMO Investigator™ Kit

Have your favorite foods been genetically modified? Genetically modified foods do not require labeling in the USA. Using state-of-the-art DNA extraction techniques, PCR, and electrophoresis, this kit allows your students to verify whether their favorite foods have been genetically modified, or not.

1:00 p.m. – 3:30 p.m. Bio-Rad Comparative Proteomics Kit

Is there something fishy about teaching evolution? Extract muscle proteins from closely and distantly related fish species, use protein electrophoresis (SDS-PAGE), generate species specific protein fingerprints, and create cladograms to infer evolutionary/phylogenetic relationships. Can molecular evidence be used to support or refute evolutionary theory? Your students decide.

notes

III. CONTRIBUTED PAPERS

1100 (time italicized and underlined) indicates a student presentation in competition for Awards of Excellence

* indicates the speaker from among several authors listed

Tuesday, June 20

**ANTHROPOLOGY and ARCHAEOLOGY
GENERAL and INTERDISCIPLINARY
HISTORY and PHILOSOPHY of SCIENCE
PSYCHOLOGY**

SOCIAL, ECONOMIC and POLITICAL SCIENCES

IPJ, Room 218

Tuesday

8:00 a.m. – 12:00 p.m.

Chair: Walter Carl Hartwig (Division of Basic Medical Sciences, Touro University College of Osteopathic Medicine, Mare Island, CA).

0800 *Williams Syndrome: Behavioral Patterns and Interventions*, **SUE R. ROSNER^{1*} and ELEANOR SEMEL²** (¹Emeritus Professor, Psychology, University of Iowa (La Jolla, CA); ²Professor Emerita, Boston University (La Jolla, CA)).

0820 *A New Quantitative Behavioral Index of Brain Function Based on Perseveration in Personality Inventory Responses*, **ALLAN H. FRANKLE and PHILLIP F. WRUBLEWSKI** (La Jolla, CA).

0840 *Comparative Study of Gestalt Processing Abilities Among Different Populations of Students*, **GEORGE CAVE***, **KATHY TONG**, **STEPHEN WOLFSON**, **LISA V. KANDRA**, and **HENRY V. SOPER** (Psychology Department, Fielding Graduate University, Santa Barbara, CA).

0900 *Differentiation Between Left and Right Hemisphere Forms of Intelligence*, **MARLENE LOBAUGH***, **CRISTINA ISAACS**, **NICHOLE MCWHORTER**, **TERI MCHALE**, and **HENRY V. SOPER** (Psychology Department, Fielding Graduate University, Santa Barbara, CA).

0920 *The Anthropology of Human Remains in Ritual Context*, **ELIZABETH MILLER** (Department of Anthropology, California State University Los Angeles, Los Angeles, CA).

0940 *Death Along the Border; from an Anthropological Perspective*, **MADELEINE J. HINKES** (Behavioral Science Department, San Diego Mesa College, San Diego, CA).

1000 **BREAK**

Chair: Donald J. McGraw (Chula Vista, CA).

1020 *Grove Karl Gilbert's Photographs as Evidence in Geology: Documenting the 1906 San Francisco Earthquake*, **MICHELE L. ALDRICH^{1*}**, **ALAN E. LEVITON²**, and **KARREN ELSBERND²** (¹California Academy of Sciences [Hatfield, MA]; ²California Academy of Sciences, San Francisco CA).

1040 *Tree Rings and the Calibration of the Radiocarbon Curve*, **DONALD J. MCGRAW** (Chula Vista, CA).

1100 *Why the Journal Impact Factor Doesn't Work for Physics*, **CASEY W. MILLER** (Department of Physics, University of California, San Diego, La Jolla, CA).

1120 *The Role of Experts/Ideas in International Economic Collaborations: The First Decade of APEC*, **RAY-SHYNG CHOU** (Communication and Science Studies, University of California at San Diego, La Jolla, CA).

1140 *Voting on Issues Involving Three or More Alternatives*, **DAVID U. MARTIN** (San Diego, CA).

EDUCATION

ENGINEERING and INDUSTRIAL SCIENCES

IPJ, Room 217

Tuesday

8:15 a.m. – 12:00 p.m.

Chair: William B. N. Berry (Department of Earth and Planetary Sciences, University of California, Berkeley, CA).

0815 *Welcome*.

0820 *The Relationship between Classroom Practices on Homework and Student Performance in Mathematics Based on the Trend of International Mathematics and Science Study in 2003*, **MING-CHIC LAN*** and **MIN LI** (Area of Educational Psychology, College of Education, University of Washington, Seattle, WA).

0840 *Environmental Education for an Evolving Society*, **JUAN-CARLOS SOLIS** (California Academy of Sciences, San Francisco, CA).

0900 *Pseudoscience and the Importance of Common Sense*, **PAUL SHIN** (Department of Chemistry and Bio-

chemistry, California State University, Northridge, CA).

0920 *Sea Semester: An Interdisciplinary Study Abroad Program with Transferable Elements for Effective Student Engagement*, **A. MICHELLE WOOD** (Sea Education Association, Woods Hole, MA, and Center for Ecology and Evolutionary Biology, University of Oregon, Eugene, OR).

0940 *Molecular Bionanotechnology Experiment in the Classroom*, **MEL I. MENDELSON** (Mechanical Engineering Department, Loyola Marymount University, Los Angeles, CA).

1000 **BREAK**

Chair: Henry Oman (Seattle, WA).

1020 *A Macroscopic Method to Separate Inner-Sphere from the Outer-Sphere Equilibrium Surface Complexes in Aqueous Electrolyte Solutions*, **ANPALAKI J. RAGAVAN^{1*}** and **V. DEAN ADAMS²** (¹Department of Mathematics and Statistics, University of Nevada, Reno, NV; ²Department of Civil and Environmental Engineering, University of Nevada, Reno, NV).

1040 *World's Declining Petroleum Production and Solutions Being Currently Adopted*, **HENRY OMAN** (Consulting Engineer, Seattle WA).

1100

Paper Withdrawn

1120 *High-Efficiency Achieved in Nature's Propulsion Muscles*, **HENRY OMAN** (Consulting Engineer, Seattle WA).

1140 *Nanotechnology, a Route to High Propulsion Efficiency*, **HENRY OMAN** (Consulting Engineer, Seattle WA).

BIOLOGICAL SCIENCES

ECOLOGY and ENVIRONMENTAL SCIENCES

EARTH SCIENCES

IPJ, Room 217

Tuesday

1:15 p.m. – 5:00 p.m.

Chair: Michael S. Parker (Department of Biology, Southern Oregon University, Ashland, OR).

1315 *Welcome*.

1320 *The San Diego County Plant Atlas Project*, **MARY ANN HAWKE*** and **JON P. REBMAN** (Depart-

ment of Botany, San Diego Natural History Museum, San Diego, CA).

1340 *Computational Analysis of Grainyhead-like Epithelial Transactivator (Get-1) Regulated Genes*, **MADHVI VENKATESH^{1*}**, **AMBICA BHANDARI²**, and **BOGI ANDERSEN²** (¹University High School, Irvine, CA; ²University of California, Department of Biological Chemistry, Irvine, CA).

1400 *Racial Diversification in Sulawesi Macaque Monkeys: Preliminary Results*, **ROBERT R. STALLMANN** (Department of Anthropology, University of California, Davis, CA).

1420 *Determination of E. coli Levels and Sources of Fecal Contamination in Strawberry Creek*, **TANNER Y.W. ZANE***, and **PAMELA Z.F. HAN*** (Environmental Sciences Teaching Program, Department of Earth and Planetary Science, University of California, Berkeley, CA).

1440 *Mitigating Selenium Ecotoxic Risk by Establishment of a Model Aquatic Ecosystem*, **KRASSIMIRA HRISTOVA,*** **JENNIFER BRADFORD**, **TERESA CASSEL**, **RADOMIR SCHMIDT**, **TERESA FAN**, and **RICHARD HIGASHI** (Department of Land, Air and Water Resources, University of California, Davis, CA).

1500 **BREAK**

Chair: J. Thomas Dutro, Jr. (US Geological Survey, National Museum of Natural History, Washington, D.C.).

1520 *Hydrologic Analysis of the Flooding-drying Cycle of Vernal Pools and Implications for Restoration*, **HUGO A. LOÁICIGA** (Department of Geography, University of California at Santa Barbara, Santa Barbara, CA).

1540 *Electromagnetics and Subsurface Mapping: A Minimally Invasive Approach for Meeting Global Water Demand*, **PAUL ROLLINS**, (Willowstick Technologies, Draper, UT).

1600 *Mineral and Energy Resources of the Salton Trough*, **MICHAEL A. MCKIBBEN** (Department of Earth Sciences, University of California, Riverside, CA).

1620 *Paleontology of the Anza-Borrego Desert, an Uninterrupted Marine Late Miocene and Terrestrial Pliocene through Pleistocene Record from the Western Salton Trough*, **GEORGE T. JEFFERSON** (Colorado Desert District Stout Research Center, Anza-Borrego Desert State Park, Borrego Springs, CA).

1640 *A Reevaluation of the Origin of the Fish Creek Gypsum*, **DAVID ESCAMILLA** (San Diego High School, San Diego, CA).

IV. CONTRIBUTED POSTERS

(15) (number italicized and underlined) indicates a student presentation in competition for Awards of Excellence

*indicates the presenter from among several authors listed

NOTE TO PRESENTERS: Boards on which to attach poster presentations will be set up in Conference Room B of the Kroc Institute for Peace and Justice, adjacent to the vendor show. The poster boards have numbers on them, which coincide with the numbers assigned to the posters in this program (see number in parentheses to the left of the title of each presentation). You are expected to use the appropriately numbered display space for your poster.

Posters should be set up prior to 9:00 a.m. on Monday, 19 June in order to allow attendees the opportunity to view them. You must be present for at least one hour between 4:00 p.m. and 7:00 p.m. Monday afternoon/evening 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 4:30 p.m. to 6:30 p.m. in order to give judges the opportunity to review and discuss your work with you.*** Posters should remain up until the end of the Presidential Reception that evening, about 9:30 p.m.

Presenters assume full responsibility for the security of their poster materials.

Monday, June 19

Kroc Institute for Peace and Justice

Room B

Monday

viewing: 9:00 a.m. – 9:30 p.m.

discussions: 4:00 p.m. – 7:00 p.m.

Please refer to card on poster to determine when presenter will be present.

Quick Directory of Posters and Sponsoring Sections

<u>poster number</u>	<u>sponsoring section</u>
1	Education
2	Education
3	Psychology
4	Social, Economic and Political Sciences
5	Social, Economic and Political Sciences
6	Health Sciences
7	Health Sciences
8	Health Sciences
9	Agriculture & Horticultural Science
10	Biological Sciences
11	Biological Sciences
12	Biological Sciences
13	Chemistry
14	Chemistry
15	Chemistry/Physics ¹
16	Chemistry/Physics ¹
17	Chemistry/Physics ¹
18	Physics ²
19	Physics ²
20	Physics ²
21	Physics ²
22	Mathematics/Biochemistry

^{1,2}See bottom of page 46.

AGRICULTURE and HORTICULTURAL SCIENCES

- (9) *Establishment of Oriental Fruit Fly (Diptera: Tephritidae) and Fopius arisanus (Sonan) (Hymenoptera: Braconidae) in French Polynesia*, **ROGER I. VARGAS^{1*}, LUC LEBLANC² and RUDOLPH PUTOA³** (¹U. S. Pacific Basin Agricultural Research Center, Hilo, HI; ²Dept. of Plant and Environmental Protection Sciences, University of Hawaii, Honolulu, HI; ³Le Service du Developpement Rural, Tahiti, FP).

BIOLOGICAL SCIENCES

- (10) *Microsite Effects on an Alpine Ecotype of the C4 Grass Muhlenbergia richardsonis, in the White Mountains of Eastern California*, **ARCHIE MEYER^{1*}, ROWAN SAGE² and JOHN B. SKILLMAN¹** (¹Department of Biology, California State University, San Bernardino, CA, USA; ²Department of Botany University of Toronto, Toronto, Ontario, Canada).
- (11) *Use of Monoclonal Antibodies 11H and 12A in the Characterization of a Tumor Associated Antigen on 9L Gliosarcoma*, **CAREN HALL^{*}, JANELL KNAUFF, and JOAN REDD** (Department of Biological Sciences, Walla Walla College, WA).
- (12) *The Phylogenetics of Panamanian Aechmea (Bromeliaceae): A Recent Adaptive Radiation?* **KERI MAHER^{1*}, ANTHONY METCALF¹, JORGE ARANDA², KLAUS WINTER², and JOHN B. SKILLMAN¹** (¹Department of Biology, California State University, San Bernardino, CA, USA; ²Biology, Smithsonian Tropical Research Institute, Panama City, Panama).

CHEMISTRY

- (13) *Characterization and Reactivity of Transition Metal Complexes towards the Hydrolysis of Phosphodiester Bonds*, **MARCEL HETU** (Department of Chemistry and Biochemistry, San Diego State University, San Diego, CA).
- (14) *Water Soluble Ligands and Metal Complexes for Aqueous Hydrolysis*, **WEN-LUNG CHANG** (San Diego State University, San Diego, CA).

CHEMISTRY/PHYSICS¹

- (15) *Effects of Controlled Oxidation and Reduction of Carbon Nanotubes*, **BRETT R. GOLDSMITH***, **YUWEI FAN**, **ALEX KANE** and **PHILIP G. COLLINS** (Department of Physics and Astronomy, University of California at Irvine, Irvine, CA).
- (16) *High Temperature Conductivity and Reactivity of Carbon Nanotube Electronic Circuits*, **ALEXANDER A. KANE*** and **PHILIP G. COLLINS** (Department of Physics and Astronomy, University of California at Irvine, Irvine, CA).
- (17) *Nano Monitors for Identification of Vulnerable Cardio-Vascular Plaque*, **RAVI K. REDDY^{1*}**, **SHALINI PRASAD¹**, **THOMAS W. BARRETT²**, **CORY BYSTROM³**, and **JOHN R. CARRUTHERS⁴** (¹Department of Electrical and Computer Engineering, Portland State University, Portland, OR; ²Internal, Hospital And Perioperative Medicine, Portland Vamc, Oregon Health Sciences University, Portland, OR; ³Proteomics Shared Resource, Oregon Health Sciences University, Portland, OR; ⁴Department Of Physics, Portland State University, Portland, OR).

EDUCATION

- (1) *DigitalNatureGuide: Software for Producing and Viewing Natural History Guides*, **RICHARD D. CAMPBELL** (Department of Developmental and Cell Biology, University of California, Irvine CA).
- (2) *Schooner Science: New-fangled Plankton Research on Tall Ships*, **A. MICHELLE WOOD^{1,2}**, **KARA LAVENDER²**, and **ERIC ZETTLER²** (¹Center for Ecology and Evolutionary Biology, University of Oregon, Eugene, OR; ²Sea Education Association, Woods Hole, MA).

¹These posters are part of the symposium *Materials Science and Nanoparticles II* (refer to page 32 for a complete description). They are presented here to enable the students to participate in the Awards of Excellence. They will also present their work orally during the symposium.

HEALTH SCIENCES

- (6) *The Relationship between Civically Engaged Pacoima Residents and the Utilization of Dental Services*, **MONICA VILLALVAZO***, **OCTAVIA ASKEW***, **HECTOR GODOY***, and **BEN FREED** (Post Baccalaureate Program, School of Dentistry, University of California, Los Angeles, Los Angeles, CA).
- (7) *A Study Examining Socio-Economic Factors associated with Absenteeism in California School Children due to Dental Problems*, **WILLIAM CRADOC***, **VALERIE MAJANO***, and **BENJAMIN FREED** (Post Baccalaureate Program, School of Dentistry, University of California, Los Angeles, Los Angeles, CA).
- (8) *A Study of Dietary Intake of Lutein/Zeaxanthin Among Modern Americans*, **UYI E. OSASERI^{1*}**, **SHIU Y. KWOK²**, **WENDY KWOK²**, and **CHICK F. TAM³**, (¹UCLA/Charles R. Drew University College of Medicine, Los Angeles, CA; ²Department of Ophthalmology, University of California, San Francisco, San Francisco, CA; ³School of Kinesiology and Nutritional Science, California State University at Los Angeles, Los Angeles, CA).

MATHEMATICS and BIOCHEMISTRY

- (22) *Chaos & Catastrophe Analysis of the Cooperative Equation*, **DAVID BLACKMAN** (Talent, OR).

PHYSICS²

- (18) *Thermosynthetic Life*, **DANIEL P. SHEEHAN** (Department of Physics, University of San Diego, San Diego, CA).
- (19) *Carnot is Not Universally True*, **KENNETH M. RAUEN** (Palo Alto, CA).
- (20) *Critique of Wheeler's "Critique of 'Centrifugal Gas Compression Cycle,'"* **KENNETH M. RAUEN** (Palo Alto, CA).
- (21) *The Proell Effect and the Superclassical Heat Engine Cycle*, **KENNETH M. RAUEN** (Palo Alto, CA).

²These posters are part of the symposium *The Second Law of Thermodynamics: Foundations and Status* (refer to page 27 for a complete description).

PSYCHOLOGY

- (3) *Independent Component Analysis of Mismatched Negativity*, **KRISTOPHER NAOWAMONDHOL***, **CYNTHIA GONZALEZ**, **CHRISTINE POURANDRIAS**, **XOCHITL SWANSON**, **LINA TAING**, **BETTY LIAO** and **STANLEY E. LUNDE** (University of California-Los Angeles, Los Angeles, CA).

SOCIAL, ECONOMIC and
POLITICAL SCIENCES

- (4) *Use of Neural Network Programming in the Development of a Disciplined and Rational Stock Trading Model to Provide an Innovative and Non-Toxic Source of Capital Funding for Small to Medium U.S. and International Corporations*, **ALFRED J. NIGL** (IntelliStat Consulting Group, Escondido, CA).
- (5) *Adult Attachment and Declining Birthrates*, **THOMAS W. DRAPER** and **THOMAS B. HOLMAN** (School of Family Life, Brigham Young University, Provo, UT).



Original photograph courtesy of Boise Convention and Visitors Bureau.

ABSTRACTS

Abstracts are listed in alphabetical order by last name of first author.
Not all presenters submitted an abstract.

Genetic Engineering of Pathogen Resistance in Mosquitoes, **ZACH N. ADELMAN**^{1,2}, **SEDEF ONAL**¹, **JENNIFER JUHN**¹, **NIJOLE JASINSKIENE**¹, **TODD MACCAULEY**¹, **MICHAEL SALAMPESSY**¹, **AURORA ASHIKYAN**¹, and **ANTHONY A. JAMES**^{1,3} (¹Department of Molecular Biology and Biochemistry, University of California, Irvine, CA 92697; ²Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061; ³Department of Microbiology and Molecular Genetics, University of California, Irvine, CA 92697; E-mail: aa-james@uci.edu).

Transposable elements (TE) are proposed as the basis for the development of gene drive mechanisms to spread pathogen-resistance genes through disease vector populations. We describe the successful use of a female germline-specific promoter and untranslated regions from the *nanos (nos)* orthologous gene of the yellow fever mosquito, *Aedes aegypti*, to control the expression of an exogenously-derived *mariner Mos1* transposase gene. Following incorporation of a transformation construct carrying this hybrid gene, transgenic lines expressed *Mos1* transposase mRNA in abundance near or equal to the endogenous *nos* transcript and exclusively in the female germ cells. In addition, the *Mos1* RNA was deposited in developing oocytes and maintained during early embryonic development. Importantly, a number of the transgenic lines examined were capable of mobilizing primary and secondary *Mos1* transgenes indicating that functional *Mos1* transposase was being produced. The *nos* control sequences show promise as part of a TE-based gene drive mechanism.

Grove Karl Gilbert's Photographs as Evidence in Geology: Documenting the 1906 San Francisco Earthquake, **MICHELE L. ALDRICH**¹, **ALAN E. LEVITON**² and **KAREN ELSBERND**² (¹California Academy of Sciences [24 Elm Street, Hatfield, MA 01038], E-mail: maldrich@smith.edu; ²California Academy of Sciences, 875 Howard Street, San Francisco CA 94103, E-mail: aleviton@calacademy.org, keelsbernd@calacademy.org).

On April 18, 1906, Grove Karl Gilbert (1842-1918) of the United States Geological Survey (USGS) was in Berkeley, conducting experiments on stream transport and evaluating the damage of hydraulic mining practices in California. He began immediately to study the effects of the earthquake, taking over a hundred photographs of structures and landscapes disrupted by the tremors and conducting fieldwork, especially north of the Golden Gate in the Bolinas-Point Reyes area. Many of these images appeared in Gilbert's ar-

ticles on the earthquake, in USGS Bulletin 324 (1907), and in a massive report (1908-1910) edited by Andrew Lawson of the University of California, *The California Earthquake of April 18, 1906: Report of the State Earthquake Investigation Commission*. Collections of his photographs eventually came to be archived at the California Academy of Sciences and at the USGS Photo Library in Denver.

Gilbert's use of photographs dated back as far as his work as an assistant to John Strong Newbery on the Ohio State Geological Survey in 1870. During his work (1871-1875) on the Wheeler Survey of the American West, Gilbert learned how to take striking photographs from master photographer Timothy O'Sullivan (1840(?) - 1882), who in turn had apprenticed to the great Civil War photographer Matthew Brady (1823(?) - 1896). Gilbert refined his photographic skill with John Hillers (1843-1925) of the Powell Survey during 1875-1879. Gilbert built up a large photographic library during the rest of his career with the USGS, documenting Niagara Falls, the Great Basin, Meteor Crater, the Sierra Nevada and the geology of Alaska (as geologist of the Harriman Expedition) in the years before 1906. After the earthquake, he continued to assemble photographs to illustrate his geological work. The publication of his images was influenced by the limitations of printing of the time; before 1890s, most of the published photographs were transferred to engravings for printing; thereafter, they began to appear as halftones and heliotypes.

Minimum Work Principle and Its Limits for Classical (Non)Ergodic Systems, **A.E. ALLAHVERDYAN**¹ and **TH.M. NIEUWENHUIZEN**² (¹Yerevan Physics Institute, Alikhanian Brothers Street 2, Yerevan 375036, Armenia; ²Instituut voor Theoretische Fysica, University of Amsterdam, Valckenierstraat 65-67, 1018 XE, Amsterdam The Netherlands; E-mail: aarmen@yerphi.am).

According to the minimal work principle, work done on a thermally isolated equilibrium system is minimal for the slowest (adiabatic) realization of a given process. This principle, one of the formulations of the second law, is operationally well-defined for any finite (few particle) Hamiltonian system. We derive the principle for classical ergodic systems. For non-ergodic systems it may or may not hold depending on certain additional conditions that we attempted to classify.

Developing and Evaluating the Conceptual Inventory of Natural Selection, **DIANNE ANDERSON** (Biology Department, Point Loma Nazarene University, 3900 Lomaland

Drive, San Diego, CA 92106; E-mail: DianneAnderson@ptloma.edu).

To develop and assess effective instructional strategies and to track conceptual understanding, it is useful to have a detailed assessment tool easily used in large classes. The Conceptual Inventory of Natural Selection (CINS) is a distractor-driven twenty-item multiple choice test that assesses understanding of ten concepts related to natural selection: biotic potential, stable populations, limited natural resources, limited survival, variation within a population, variation inherited, differential survival, change in populations, origin of variation, and origin of species. The development and field testing of items, as well as the validity, readability, reliability and factor analysis of the CINS will be described. There was significant correlation between student performance on the posttest CINS and the end-of-semester interviews; this supports the hypothesis that a multiple-choice test can be used as a meaningful assessment of conceptual understanding. Comparison of results for diverse student populations indicates that the most challenging topics are random origin of variation, origin of species, and change in a population over time.

Transposons and Their Behavior in Mosquitoes: Implications for Gene Drive Strategies, **PETER W. ATKINSON** (Department of Entomology, University of California Riverside, CA 92521).

Transposons are used to genetically transform mosquitoes and some aspects of their mobility properties cause them to be considered as agents of gene drive in mosquitoes in which genes preventing the spread of human pathogens would be actively spread through mosquito populations. We contend that in order to effectively use transposons in this role, a comprehensive understanding of their mode of action and their population biology must be obtained. Knowledge so gained can then be used to construct transposons with known mobility and stability properties leading to more confident predictions of their behavior following introduction into mosquitoes. We focus on one superfamily of transposons which contains at least four active members in insects, two being in mosquitoes. Our research has several components. We discover and characterize new active transposons from mosquitoes. We determine their *in vivo* and *in vitro* mobility properties. From the crystal structure of one of these, *Hermes*, we can predict which amino acids and domains are important for their mobility properties. We have developed mutagenesis strategies that enable us to generate and screen for hyperactive mutants of these transposases which we then test in *Drosophila* and mosquitoes. We have identified host encoded factors that specifically interact with these transposons and have developed models explaining how they may regulate transposition *in vivo*. Finally we have constructed chimeric transposases in which transposase expression is confined to the mosquito germ-line and demonstrated that this may lead to increased transposition in this tissue.

From the Dynamics of Coupled Map Lattices to the Psychological Arrow of Time, **HARALD ATMANSPACHER** (Institut für Grenzgebiete der Psychologie und Psychohygiene e.V., Department of Theory and Data Analysis, Wilhelmstr. 3a D--79098 Freiburg, Germany; E-mail: haa@igpp.de).

Stable neuronal assemblies are generally regarded as neural correlates of mental representations. Their temporal sequence corresponds to the experience of a direction of time, sometimes called the psychological time arrow. We show that the stability of particular, biophysically motivated models of neuronal assemblies, called coupled map lattices, is supported by causal interactions among neurons and obstructed by non-causal or anti-causal interactions among neurons. This surprising relation between causality and stability suggests that those neuronal assemblies that are stable due to causal neuronal interactions, and thus correlated with mental representations, generate a psychological time arrow. Yet this impact of causal interactions among neurons on the directed sequence of mental representations does not rule out the possibility of mentally less efficacious non-causal or anti-causal interactions among neurons.

Microbial Aspects of Sediment Transport, **FAROOQ AZAM¹, FRANCESCA MALFATTI¹, JOHNNY NGUYEN¹, PAOLA DE NEGRO², and CHIARA LARATO²** (¹Scripps Institution of Oceanography, UCSD, La Jolla, CA 92093, USA; ²Marine Biological Laboratory, 34010 Trieste, Italy).

As a component of the SIOSED project we are assessing the impact of sediment translocation in the Venice lagoon on microbial communities and processes in the water column and the upper 1 cm of the sediment, with emphasis on the effects on the carbon cycling and the microbial transformation of contaminants along the food web. Our goal is to study the consequences of sediment manipulation and transport on microbial processes and their ecosystem level effects. Specific questions to be addressed are: 1) Will sediment manipulation significantly increase microbial carbon cycling and system BOD? Will it cause bacterial "blooms"? Will it change bacterial community composition? 2) Will the qualitative and quantitative variations in particle-associated bacteria result in reduction or increase in particle "stickiness", potentially influencing sediment transport? 3) Will enhanced bacterial action on organic matter (e.g. enzymatic hydrolysis of polymeric and particulate organic matter) liberate ligand-associated metals (e.g. Hg, Cr, Cu), thus changing qualitatively their interactions with the biota (e.g. toxicity or bioaccumulation)? 4) What are the implications of sediment manipulation for the microbial food web structure (and pollutant transfer pathways)? In order to address these questions we are studying microbial process rates, community composition dynamics and biochemical bases of microbial interactions with organic matter and pollutants. A two-year time-series of regular sampling is ongoing. While only preliminary

results will be available at the time of the meeting they may provide useful constraints on the overall results of SIOSED, as well as help inform the interested scientific community on the goals of the project.

The "SIOSED" project is part of a comprehensive effort to support the integrated management of Venice Lagoon sediments and ecosystems promoted by the Venice Water Authority through its Concessionary, Consorzio Venezia Nuova.

Towards a Sustainable Operation of the Guadalupe Valley Aquifer, **A. BADAN¹, T. KRETZSCHMAR¹, I. ESPEJEL², T. CAVAZOS¹, H. d'ACOSTA³, P. VARGAS⁴, L. MENDOZA², C. LEYVA², G. ARAMBURO², W. DAESSLE², and B. AHUMADA²** (¹CICESE, Apdo. Postal 2732, 22800 Ensenada, México, ²Facultad de Ciencias, U.A.B.C., Ensenada, ³Asociación de Vitivinicultores de Baja California, ⁴Secretaría de Desarrollo Urbano y Ecología, Gob. Del Edo. de Baja California; E-mail: abadan@cicese.mx).

The Guadalupe Valley aquifer includes a direct catchment area of 100,000 hectares (10^9 m²) and receives close to 25 million m³ of rainfall each year. Nonetheless, extractions for agricultural and urban uses much exceed that amount, so the water table is depleted steadily. Providing the city with water from alternate sources, amongst them sea-water desalination, is feasible and would reestablish a proper balance of the aquifer. Additional measures to minimize evaporation and increase infiltration above the current levels close to 10%, such as modern irrigation techniques, the protection of the chaparral and adjacent riparian units and, in some cases, the reuse of treated sewage water, should reinvigorate the region's vocational activities, with considerable social, environmental and economic benefits. A thorough management plan should include the stoppage of sand extraction, a moratorium to redesign the distribution of water rights, and the proper urban planning of regional population centers.

Microbial Biodiversity in Surficial Anoxic Sediments of the Venice Lagoon, **FRANCO BALDI¹, SARA BORIN², LORENZO BRUSETTI², and DANIELE DAFFONCHIO²** (¹Departement of Environmental Science, Cà Foscari University, Calle Larga S. Marta, 30121, Venezia, Italy; ²Dipartimento di Scienze e Tecnologie Alimentari e Microbiologiche, sez. Microbiologia Agraria Alimentare ed Ecologica (DISTAM), Università degli Studi di Milano, Via Celoria 2, 20133 Milano).

This investigation of microbial community in the Venice Lagoon was carried out within the monitoring program MELa3, part of the comprehensive effort for an integrated management of Venice Lagoon ecosystems promoted by the Venice Water Authority through its Concessionary Consorzio Venezia Nuova. This investigation was carried out in order to identify the species of bacteria and archaea living on a surficial layer of sediments and to determine their role in organic matter degradation. Ten stations were localized in the Venice Lagoon representing almost all the specific environments.

These stations were the same as those of the ICSEL project dedicated to a biological survey in the lagoon. The sediments were taken with a corer and the first 3 cm of three different cores were mixed to obtain a more representative sample of the station. Some environmental parameters such as pH and Eh were determined *in situ*, whereas the abundance of microbes were determined in the laboratory by microscope and total DNA extracted. Seven sediments out of ten were anoxic, 2 were hypoxic and only one was oxidized. Metabolic profiles of microbial community were screened with AN-Biolog for anaerobes. Principal component analysis (PCA) distinguished two different microbial populations, on the basis only of microbial fermenting activity, but not in respect to anaerobic respiration. In addition, a good correlation was found between the amount of substrate consumption and DNA extracted from sediments. DGGE analyses of the bacterial population failed, whereas it was possible to identify archaea by nested PCR in all stations, with 6 species belonging to *Desulfurococcales*, 1 to *Methanomicrobium* and 9 to *Thermoplasmatales*. The structure of the bacterial population was analyzed with Automated Ribosomal Intergenic Space Analysis (ARISA), which showed a population with a high value of richness from 60 to 80 species per sample. Statistical analyses of the diversity index gave a very low dominance index ranging from 0.0211 to 0.0807, a high Shannon index (ranging from 3.03 to 4.12, and a high equitability index ranging from 0.724 to 0.946). Principal component analysis distinguished three ARISA groups of sediments containing three different populations of bacteria. In the three sediments, each belonging to a specific ARISA group, the total extracted DNA was used to produce three gene libraries. The station adjacent to Marghera (the industrial part of Venice) was dominated by gamma-proteobacteria, mainly *Vibrionaceae* and *Alteromonaceae*. The station sited in the northern part of Venice Lagoon was dominated by delta-proteobacteria and Bacteroides. The station in the southern part of the lagoon was dominated by delta-proteobacteria and gamma-proteobacteria, mainly Chromatiaceae. The distribution of bacteria and archaea in the sediments seems related to microbes correlated to the sulfur cycle in stations far from the city of Venice, whereas those adjacent to the city were dominated by bacteria typical of urban pollution.

Culture-Based and Nucleic-Acid Based Monitoring of Pathogen Levels in the Sediments of the Venice Lagoon, **DOUGLAS H. BARTLETT and LEENA PALEKAR** (Scripps Institution of Oceanography, La Jolla, CA, 92093-0202, USA).

The Venice lagoon is well documented to be contaminated with heavy metals and other chemical pollutants, and to also periodically experience sewage input. In order to assess the levels of sewage-associated indicator bacteria at various locations in the lagoon we have utilized culture-based approaches using sediments which have been collected on a

regular basis since June , 2005. Colilert™ and Enterolert™ kits were used for monitoring *Escherichia coli* and *Enterococcus* indicator bacteria levels. While these microbes were detected, their levels were typically well below the threshold levels followed by the State of California. We have also begun to utilize molecular methods to follow the presence of certain bacteria and viruses. DNA has been extracted from lagoon sediments and polymerase chain reaction primers have been obtained for various types of enteroviruses, adenoviruses, the vibrios *V. vulnificus*, *V. parahaemolyticus* and *V. cholerae*, the *Bacteroides-Prvotella* group and *Escherichia coli*. The results of these analyses will be presented and discussed.

This work is a component of the "SIOSED" project, a part of a comprehensive effort to support the integrated management of Venice Lagoon sediments and ecosystems promoted by the Venice Water Authority through its Concessionary, Consorzio Venezia Nuova.

Using Item Response Theory to Visualize Conceptual Change, **BRYCE BATTISTI** (School of Education, University of California, One Shields Avenue, Davis, CA 95616-8579; E-mail: btbattisti@ucdavis.edu).

Item Response Theory (IRT) is well suited to characterizing response patterns on tests that measure understanding of scientific principles. IRT provides an estimate of an examinee's ability to answer an item correctly based on the difficulty of the item and the examinee's pattern of responses to each of the other items in the test. Each examinee's ability is estimated through an iterative process that maximizes the accuracy of an original calculation. Examinees' performance on each item is plotted on a graph against the spectrum of abilities of the population of examinees. Data analyzed using IRT can be displayed in graphs called item characteristic curves (ICC's). ICC's display a trace line for each item option. ICCs show that the probability for choosing the correct answer to any particular item typically increases with level of understanding. Conversely, the probability of choosing any distractor, or wrong answer, typically decreases with level of understanding. Analysis of multiple-choice tests is usually performed using well-known Classical Test Theory (CTT) statistical methods and readily available software. The limitations inherent in CTT include the inability to generalize test results to other groups who take the same test or the same group that takes a different version of the test. IRT allows for detailed and comprehensive analysis of the patterns of examinee responses providing a window into the process of conceptual change.

Ecdysone Agonists: A New Class of Insect Growth Regulators as Mosquito Biopesticides, **NANCY BECKAGE**, **RICKY MAI**, and **KRISTINA DILL** (Departments of Entomology & Cell Biology and Neuroscience, University of California-Riverside, Riverside, CA 92521; E-mail nancy.beckage@ucr.edu).

Ecdysone agonists offer significant promise as mosquito

biopesticides for control of disease vector mosquitoes. Previous work by the Beckage laboratory has shown that the ecdysone agonist RH-2485 is the most potent agonist compared to RH-5992 and RH-5849 in disrupting development of *Anopheles gambiae*, *Aedes aegypti*, and *Culex quinquefasciatus*. *Anopheles gambiae* is the most susceptible of the three species to all three agonists. The observed biological effects of these compounds on mosquitoes included the induction of the onset of precocious incomplete molting. In some cases, mosquito larvae synthesized a new cuticle but failed to ecdyse and shed the exuvium, and died trapped within their larval cuticle. In experiments with *Ae. aegypti*, third instar larvae were found to be more susceptible compared to fourth instars, providing evidence that younger larvae are more sensitive to this class of compounds. Treated larvae descended to the bottom of the water column in their rearing cup by 2 days post-treatment, where they eventually died. The formulated RH-2485 derivative INTREPID was slightly less effective compared to technical RH-2485 in disrupting development of *Ae. aegypti* larvae. These insect growth regulators offer potential for control of mosquitoes to decrease the frequency of pathogen transmission to humans. Effects of these compounds on vectors of West Nile virus in California are now being assessed.

Smart Irrigation Controllers Save Water, Reduce Runoff and Pollution - What Next? **JOE BERG** (Water Use Efficiency Programs Manager, Municipal Water District of Orange County, 10500 Ellis Avenue, Fountain Valley, CA 92728; E-mail: jberg@mwdoc.com).

Weather based irrigation timers also known as SmartTimers are proving to be a viable tool to save valuable water supplies, reduce nuisance runoff and reduce non-point source pollution in urban areas. Water agencies have utilized this tool to generate quantifiable and reliable water savings from urban and agricultural landscapes. The Municipal Water District of Orange County and Irvine Ranch Water District completed research studies that quantify benefits associated with using SmartTimers. Study results will be summarized in the presentation. These studies have initiated a revolution in irrigation in the following areas: 1) controller testing protocols developed by water agencies, 2) the Irrigation Association and the Center for Irrigation Technology; 3) the possibility of a manufacturing standard by 2010; and 4) justification for large scale implementation incentive programs by water agencies throughout California. Efficient irrigation incentive programs now exist such as grants from the Department of Water Resources and State Water Resources Control Board - establishing a link between water supply management and watershed management.

Empirical Research on the Radical Subjective Solution of the Measurement Problem. Does Time Get Its Direction Through Conscious Observation? **DICK J. BIERMAN** (Univer-

sity of Amsterdam, Amsterdam, The Netherlands, Roeterstraat 15, 1018WB Amsterdam, The Netherlands; E-mail: d.j.bierman@uva.nl).

In four experimental studies we explored the so-called ‘radical subjective’, and rather controversial, solution of the measurement problem. This solution posits that an interaction with a conscious entity is required to complete the measurement. Thus the collapse of the wave packet is assumed to be causally linked to a conscious observation. Under the assumption that the brain is sensitive for the difference between observing a quantum (superposition) state and a classical state this radical solution can be tested. A radioactive source was used to trigger beeps that first were delayed for 1 second and then were observed by a (final) observer from whom a continuous recording of brain activity was made. In about 50% of the events, another (pre) observer got feedback of this quantum event *before* the final observer. In those cases, presumably the pre-observer’s observation resulted in collapse of the wave-packet while in the other half of the cases the final observer was ‘producing’ the collapse. The brain signals of the final observer for the two types of events were compared. The ambiguous results of the 4 studies will be discussed.

If consciousness is the crucial ingredient for ‘collapse’ to occur, then this might also give a new anthropocentric hypothesis with regard to the ‘arrow of time’. The projection postulate implies a irreversible process of reduction and hence can be seen as one of the few non time-symmetric processes in physics. If consciousness is required to have a collapse then it might follow that consciousness introduces time asymmetry into physics. New neuro-cognitive models of consciousness suggest that the neural correlate of conscious experience (rather than non conscious processing) is the occurrence of massive parallel recurrent (i.e. non linear) neural activation. This the collapse of the wave packet would become associated with a strong non-linear process. This fits, at least in a metaphorical sense, with the theoretical results where an introduction on a non linear term in the Schrödinger equation results in an ‘objective’ reduction of the wave packet.

Chaos & Catastrophe Analysis of the Cooperative Equation, **DAVID BLACKMAN** (307 W 2nd St., Talent, OR 97540; E-mail: gribear@mac.com).

A Chaos and Catastrophe analysis of the cooperative binding equation, or hill equation. The analysis produces a bifurcation diagram with a fold catastrophe at the bifurcation point. A function implicitly defines bifurcation diagram in terms of the Half Saturation Point, K, and substrate concentration, s. There exist a vector equation $\langle K, s \rangle$ locates the bifurcation point for any given choice of the Hill coefficient, p. There may be real world consequences to this analysis.

Subsidence of the Venice Lagoon from Continuous GPS and InSAR Permanent Scatterers, **YEHUDA BOCK**,¹ **SHIMON**

WDOWINSKI,² **ALESSANDRO FERRETTI**,³ **GIOVANNI CECCONI**⁴, and **GIULIANO SAVIO**³ (¹Cecil H. and Ida M. Green Institute of Geophysics and Planetary Physics, Scripps Institution of Oceanography, La Jolla, California, USA; ²Division of Marine Geology and Geophysics, University of Miami, Miami, Florida, USA; ³Tele-Rilevamento Europa – T.R.E., Milano, Italy; ⁴Consorzio Venezia Nuova, Venezia, Italy).

We estimate the subsidence of the Venice lagoon based on CGPS measurements from 2001-2005, and InSAR permanent scatterers data from 1992-2001. The CGPS data show subsidence with respect to ITRF2000 of -4.0 ± 0.4 mm/yr at the northern edge of the lagoon at Cavallino, -1.7 ± 0.3 mm/yr at its southern edge in Chioggia, and 0.1 ± 0.4 mm/yr at a stable inland station near Padua. Using the inland site as a reference, the PSInSAR analysis agrees with the CGPS at the two lagoon sites, but provides much finer spatial resolution and delineates subsidence throughout the area of 1-7 mm/yr, with 1-3 mm/yr of soil motion in the more recent parts of the City of Venice and of the banks exposed to settlement by wave actions. Analysis of the combined 14-year baseline time series indicates a subsidence rate of -2.3 ± 0.05 mm/yr in the southern lagoon and -4.9 ± 0.05 mm/yr in the northern lagoon.

Preparation and Characterization of Au-Zeolite Catalysts for CO Oxidation, **NINA BOGDANCHIKOVA**¹, **ANDREY SIMAKOV**¹, **INGA TUZOVSKAYA**¹, **ALEXEY PESTRYAKOV**², **MIGEL AVALOS**¹, **MARIO FARIAS**¹, and **E. LIMA**³ (¹CCMC-UNAM, Apdo Postal 2681, Ensenada, B.C., Mexico; ²Tomsk Polytechnical University, Tomsk 634034, Russia; ³Universidad Autónoma Metropolitana, 09340, México; E-mail: nina@ccmc.unam.mx).

About 20 years ago, it was shown that dispersed Au supported on metal oxides have activity in CO oxidation at ambient and even lower temperatures. This has opened new horizons for catalytic processes of energy saving and dangerous gas removal. Also, composites of dispersed gold are have potential applicaiton in medicine as antibacterial agents.

In the present work, studies of nanogold in zeolites by TEM, UV-Visible spectroscopy, XPS, IR-CO and ¹²⁹Xe NMR, EXAFS spectroscopies were performed. The study showed that the ionic Au (III) precursor is decomposed partially at room temperature with formation of few atomic gold clusters (less then 1 nm in diameter). Sample reduction with hydrogen at temperatures above 100°C leads to: (i) reduction of cations Au³⁺, (ii) formation of nanoparticles with the size 1-10 nm on the external surface of zeolites, (iii) stable preservation of clusters even at temperatures higher than 300°C.

Catalytic tests in CO oxidation showed difference in reactivity of different gold species. The results of various methods allowed assigning the active sites in low temperature region to gold clusters. The sites active at high temperature were assigned to nanoparticles.

The Role of the Hippocampus in Recognition Memory, **NICOLA J. BROADBENT**¹, **LARRY R. SQUIRE**^{1,2}, and **ROBERT E. CLARK**^{1,2} (¹University of California San Diego, La Jolla, CA 92093; ²VA Healthcare System, San Diego, CA 92161; E-mail: nbroadbent@ucsd.edu).

Recognition memory is the capacity to recognize a previously encountered item as familiar, and is encompassed under the rubric of declarative memory (i.e. memory for facts and events). Declarative memory is supported by a system of anatomically-related structures in the medial temporal lobe that include the hippocampus. The hippocampus is the final stage of convergence within the medial temporal lobe, receiving projections from the adjacent perirhinal and parahippocampal cortices, as well as the entorhinal cortex.

Because of its unique position in the information processing hierarchy, it has been supposed that one role of the rodent hippocampus is to relate or combine information from multiple sources. Indeed, lesions of the dorsal hippocampus that encompass as little as 40% hippocampal volume profoundly impair spatial memory. Whether visual recognition memory in rodents is similarly dependent on the hippocampus is controversial. One reason why spatial memory may be sensitive to hippocampal damage in rodents, and thus more often reported, could be that these tasks are more difficult (possibly akin to recall tasks in humans), and thus require more hippocampal circuitry to support memory. In contrast, simple recognition memory tasks may require less hippocampal circuitry to support performance, and as a consequence require larger lesions of the hippocampus before impairments are evident. Indeed, our studies of the relationship between hippocampal lesion size and visual recognition memory show that large, nearly complete lesions of the hippocampus impair visual recognition memory.

Encounters at the Frontiers of Time: Questions Raised by Anomalous Human Experiences, **RICHARD S. BROUGHTON** (Division of Psychology, The University of Northampton, Boughton Green Road, Northampton NN2 7AL, UK; E-mail: richard.broughton@northampton.ac.uk).

This presentation is not about the physics of reverse causation but about the observations of nature that give rise to this inquiry, and which remain the touchstone against which explanations must be tested.

Reports of precognition—seeing the future—are as old as recorded history, and systematic investigation of individual cases began over a century ago. With mounting evidence that precognition could be a real phenomenon came the realization that this amounted to reverse causation. Events in the future changed human behavior in the present. This proved to be a headache for philosophers and a continuing challenge to physicists.

Cases drawn from the most studied collections will illustrate several key questions about the nature of reverse causality that grow out of these experiences.

What are the principal ways in which we apparently experience reverse causation? Does the fact that the experience happens most commonly in dreams suggest anything about human physiology that is relevant? Must conscious awareness be involved, or can the future change present behavior without conscious awareness?

Does one see the “actual” future as if it were fixed, or some possible future, and what about the small number of cases in which a person intervenes to prevent the foreseen event?

Humans are future oriented. Evolution has optimized our brains for information acquisition and storage that permits us to excel at planning, assessing probabilities and making decisions about future action. If reverse causation is possible it would not be surprising that evolution would have presented humans with a means of capitalizing on it.

Simulations of a Stratified Shear Layer, **KYLE BRUCKER and SUTANU SARKAR** (University of California, San Diego, Mechanical and Aerospace Engineering Building EBU-II, mail code 0411, 9500 Gilman Dr., La Jolla, CA 92037-0411; E-mail: kbrucker@ucsd.edu).

Direct Numerical Simulations of the turbulent shear layer are utilized to elucidate the large scale structures and the small scale statistics. Both the large scale structure and the flow statistics show a marked difference depending on whether the shear and stratification are parallel or perpendicular. In the parallel, or vertical shear vertical stratification case, no large scale structures persist at late times, however the small scales remain energetic so long as the stratification is not too severe. In the perpendicular case, or horizontal shear vertical stratification, coherent large scale structures with a lattice of dislocated columns of vertical vorticity can be seen at late times. Here too, the small scales remain energetic. In both cases the velocity fluctuations become more anisotropic, and vertical gradients dominate the dissipation rate of both kinetic and potential energy. Even though the large scale dynamics are very different, the behavior of the small scales has remarkable similarities. The potential of large eddy simulation to predict stratification effects on the shear layer will also be discussed.

Using Children's Literature To Develop Critical Thinking Skills, **SANDY BUCZYNSKI** (School of Leadership and Educational Sciences, University of San Diego, 5998 Alcalá Park, San Diego, CA 92110; E-mail: sandyb@SanDiego.edu).

When Goldilocks encountered bowls of porridge at different temperatures in the three bear's house, she was able to make compelling observations and come up with one of the most recognizable lines in children's literature, “This porridge is too hot; this porridge is too cold; this porridge is just right!” The story line produces an effective context to assist learners in developing critical thinking skills with an empha-

sis on reasoning ability. Affective and cognitive strategies including independent thinking, transference of insights into new contexts, making predictions, development of criteria for evaluation, drawing valid conclusions, examining assumptions, and using a science notebook create a working framework for teaching critical thinking skills.

Does the Action of the Mind Take Place at the Molecular Level? **JEAN E. BURNS** (1525 153rd Ave., San Leandro, CA 94578; E-mail: jeanbur@earthlink.net).

A model is presented in which the action of the mind takes place through the ordering of the thermal motion of molecules. Examples are given which show that the ordering of 10^4 molecules is sufficient to (a) produce detectable PK results and (b) open sufficient ion channels in the brain to initiate a physical action.

The relationship of the above model to entropy, the arrow of time, and the possibility of retrocausation is discussed.

Entropy and the Randomizing Effect of Vacuum Radiation, **JEAN E. BURNS** (1525 153rd Ave., San Leandro, CA 94578; E-mail: jeanbur@earthlink.net).

Vacuum radiation causes a particle to make a random walk about its dynamical trajectory. In this random walk the root mean square change in spatial coordinate is proportional to $t^{1/2}$, and the fractional changes in momentum and energy are proportional to $t^{-1/2}$, where t is time. Thus the exchange of energy and momentum between a particle and the vacuum tends to zero over time. Even at the end of a mean free path the fractional change in momentum of a particle in a gas is very small. However, at the end of a mean free path each particle undergoes an interaction that magnifies the preceding change. It can be shown that the net result of the action of vacuum radiation on the particles in a gas is sufficient to randomize the momentum distribution in a few collision times. A similar conclusion can be reached for solids and liquids, and it can be concluded that entropy increase is produced by the random action of vacuum radiation.

Vacuum radiation is ordinarily homogeneous, isotropic, and of a specified intensity at each wavelength, yet it is known that this radiation can be manipulated such that it has decreased intensity, or is non-homogeneous or non-isotropic, in some circumstances. This offers the possibility that entropy increase could be correspondingly manipulated.

The San Quintin Coastal Lagoon, **VICTOR F. CAMACHO-IBAR** (Instituto de Investigaciones Oceanologicas, Universidad Autonoma de Baja California., P.O. Box 453, Ensenada, Baja California, Mexico 22860; E-mail: vcamacho@uabc.mx).

San Quintin Bay (SQB) is a slightly hypersaline coastal lagoon located in the Pacific coast of Baja California, some 250 km South of the Mexico-U.S. border. By contrast with most estuaries in Southern California, this coastal lagoon

is still relatively well preserved. The lagoon is an important site for wintering of black brants and initiatives have been taken to recommend it for its designation as a wetland of international importance under the Ramsar Convention. Apparently, the occurrence of extensive intertidal eelgrass meadows in SQB is a special feature of this lagoon when compared to other embayments in southern California and Baja California where most eelgrass grows subtidally; accessibility to these meadows is probably the reason why migrating birds which forage on eelgrass prefer SQB. There is still, however, limited information on the processes which control the high productivity and the spatial distribution of primary producers, including eelgrass, within the bay. By contrast with most estuaries in southern California, due to the aridity of the area SQB receives essentially no terrestrial freshwater inputs most of the year, and even during winter which represents the rainy season. The fertilization of SQB is therefore carried out almost exclusively by oceanic inputs, and particularly during the upwelling season between late spring and early summer. In this talk I will show some results of an ongoing multidisciplinary oceanographic study aiming to evaluate the physical, chemical and biological responses of SQB to upwelling pulses from the adjacent ocean.

DigitalNatureGuide: Software for Producing and Viewing Natural History Guides, **RICHARD D. CAMPBELL** (Department of Developmental and Cell Biology, University of California, Irvine CA 92697; E-mail: rcampbel@uci.edu).

DigitalNatureGuide is free software for making and viewing computer-based natural history identification manuals. Developers add digital images and, optionally, text, character traits and geographical distributions for any group of animals or plants and users can not only view the images and text but select for species on the basis of character states or geographic distribution.

Developing a guide is largely automated. Images, text, character traits and geographic distributions can be simply entered graphically. Images used for identification can include different types of pictures, such as flowers, leaves and seeds, for each species. An unlimited number of other images can accompany the unlimited, html-formatted text for each species. Guides are fully functional from the beginning so new species, characteristics and text can be added successively in any order.

Guides are viewed and navigated mainly by a mouse. Species can be selected by character states and geographic distribution (to the extent these data have been added) and reordered in various ways. A species list is available which allows users to select any species, genus or family. There is a flashcard game for learning the names and appearances of the species.

DigitalNatureGuide, and several guides, can be downloaded at: <http://rcampbell.bio.uci.edu/DigitalNatureGuide>).

Simulation and Optimization of the Guadalupe Valley Aquifer, **JOSE RUBEN CAMPOS-GAYTAN¹** and **THOMAS KRETZSCHMAR²** (¹Departamento de Geofísica Aplicada, Centro de Investigación Científica y de Educación Superior de Ensenada, Km 107 Carretera Tijuana-Ensenada BC, 22860, México, E-mail: rcampos@cicese.mx; ²Departamento de Geología, Centro de Investigación Científica y de Educación Superior de Ensenada, Km 107 Carretera Tijuana-Ensenada BC, 22860, México, E-mail: tkretzsc@cicese.mx).

A regional groundwater flow model was developed, in order to evaluate the water table behavior in the region of the Guadalupe Valley, in Baja California, Mexico. The State of Baja California has been subject to an increment of the agricultural, urban and industrial activities, implicating a growing water-demand. However, the state is characterized by its semi-arid climate with low surface water availability; resulting in an extensive use of groundwater in local aquifer. Based on historic piezometric information of the last two decades, however, a negative evolution could be observed, resulting a negative storage volume. So far, there is not an integral hydrogeological evaluation that determine the real condition of the groundwater resource, and that permit to planning a management of the Guadalupe Valley aquifer. Both steady-state and transient calibration were carried out in order to obtain the best possible match to measured levels at the Guadalupe Valley aquifer. The contours of calculated water table elevations for January 1983 were chosen as an approximate representation of steady-state conditions. Generally, the comparison of the observed and calculated water table configurations have a good qualitative and quantitatively adjustment. The simulation model was coupled with mathematical optimization algorithms to evaluate the effects of the current groundwater management alternative in the Guadalupe Valley Aquifer. The results of this simulation-optimization are used to determine an optimal groundwater withdrawal which ensures a sustainable management of the aquifer. Nowadays, it is count with a hydrogeological model that can be used for simulates the groundwater flow in the region of the Guadalupe Valley.

Comparative Study of Gestalt Processing Abilities Among Different Populations of Students, **GEORGE CAVE**, **KATHY TONG**, **STEPHEN WOLFSON**, **LISA V. KANDRA**, and **HENRY V. SOPER** (Psychology Department, Fielding Graduate University, 2112 Santa Barbara Street, Santa Barbara, CA 93105; E-mail: georgecave@earthlink.net).

Left hemisphere, analytic intelligence is assessed by most intelligence tests and correlates highly with academic performance. A right hemisphere, more gestaltic or big picture intelligence involves the ability to process relationships of objects, concepts, and the like as would be needed for reading body language, comprehending subtle prosody, and using accurate pragmatics. We decided to compare samples

from populations which might be expected to show strengths in right hemisphere, gestaltic functioning. We used the 13-item Street Completion Test with ten additional difficult items. The expanded Street was administered to 79 graduate students in an institute of photography, 69 graduate students in a department of clinical psychology, and 270 undergraduate students. It was thought that the psychology graduate students would have better than average gestalt functioning, but that those seeking advanced degrees in photography would have even greater abilities. On the 13-item Street the photography graduate students scored slightly, but not significantly, higher ($p = .529$) than the undergraduates, but worse than the clinical psychology ones ($p = .017$), who in turn outperformed the undergraduate students ($p = .001$). Curiously, the photography students did outperform the undergraduates on the more difficult extra items ($p = .048$). In retrospect the results should not have been surprising. We know that most trained musicians use a predominantly analytic mode to process music, hence the left hemisphere. Trained photographers probably also use analytic methods where others would use more gestaltic ones.

Exploring the World Ocean: A New, Inquiry-Based "Tool" for Teaching 21st Century Oceanography, **W. SEAN CHAMBERLIN** (Earth Sciences, Fullerton College, 321 E. Chapman Ave, Fullerton, CA 92832; E-mail: schamberlin@fullcoll.edu).

Public understanding of science often relies on a one-way flow of information from scientists and science educators to academic and media outlets. This model of science education presumes that a scientifically informed public is a scientifically literate one. Unfortunately, this view portrays science education as a passive collection of facts rather than an active process of discovery. A collaborative effort by a community college educator and an oceanographic research scientist has produced a new textbook in which inquiry and active learning are central to the teaching and learning of science. Using oceanography as a vehicle for achieving science literacy, this textbook integrates traditional oceanographic content with newly emerging ideas and debates concerning the nature of how the ocean works. Chapter lessons are combined with hands-on and minds-on activities, many of which make use of real-time data from ocean observatories, Earth orbiting satellites and other real-time data platforms. By merging inquiry-based activities and content, students engage in the process of science and develop the skills and understandings that are paramount for a science literate public. This presentation provides sample chapters, sample activities and opportunities to interact with online materials developed for the textbook.

Water Soluble Ligands and Metal Complexes for Aqueous Hydrolysis, **WEN-LUNG CHANG** (San Diego State University, 5500 Campanile Drive, San Diego, CA 92182; E-

mail: alex.wlchang@gmail.com).

Phosphoester bonds are contained in many different substances such as DNA, RNA, dichlorvos, sarin nerve gas, and etc. The half-life of phosphate diester bond in DNA in neutral water solutions at 25°C has been proved to be on the order of tens to hundreds of billions of years. However, hydrolysis of phosphate diester bond is of critical importance in most basic cellular functions, including DNA repair, excision, transcription, integration and metabolism, signal transduction. With the existence of catalysts, we can speed up the progress of hydrolysis of phosphoester bonds. Also, environment-protection issues have been getting more and more attention. Therefore development of environment-friendly catalysts of phosphoester bonds is more and more important. Water soluble ligands with two N-atom donors and an anionic O-atom donor have been synthesized. The catalytic efficiencies of these ligands will be compared to those of the corresponding metal complexes with analogous ligands with three N-atom donors with the same anionic O-atom so that we can learn how differences in the coordination environment of the metal centers affect the rate of phosphate ester hydrolysis. The structures and the kinetic studies of the metal complexes of these N-donor ligands will also be discussed.

How Much Science in Contemporary Science-Themed and Nature Poetry? **ROBERT LOUIS CHIANESE** (Department of English, California State University, 18111 Nordhoff Street, Northridge, CA 91330-8248; E-mail: robert.chianese@csun.edu).

A number of factors have turned contemporary poets to science for both information and inspiration. The environmental crisis absorbs many writers. Ecology and sustainability have found adherents in nature poets, with a whole school of critical theory--eco-criticism—dedicated to examining human relationships to nature. Fascination with new cosmologies, genetics, brain function, human evolution, etc., pervade both popular and general academic culture. But just how scientifically informed are contemporary poets who avowedly treat such topics; and equally, how informed about science must general readers of this poetry be in order to understand and appreciate it? A study of hundreds of recent poems in science- and nature-themed poetry anthologies reveals that “nature” poetry mainly retains its personally-reflective, descriptive, and emotive foci without too much concern for the factual evocation of the environment, while science-themed poetry pushes readers to the limits of general scientific literacy by poetizing on some of the most difficult and abstruse scientific ideas. That some major poets produce such verse and that it has recognized poetic merit may suggest that a “New Order of Ideas” that nineteenth-century critic Matthew Arnold said was needed for a shift of paradigms in the arts and society has arrived.

The Role of Experts/Ideas in International Economic Col-

laborations: The First Decade of APEC, **RAY-SHYNG CHOU** (Communication and Science Studies, University of California at San Diego, 9500 Gilman Dr, #0503, La Jolla, CA 92093-0503; E-mail: rachou@ucsd.edu).

This paper aims to examine the relationship between experts (e.g. economists) and international economic collaborations such as *Asia-Pacific Economic Cooperation* (APEC). As the majority of APEC members were developing economies, the initial institutional goal of APEC was focused on business facilitation and economic capacity building rather than aggressive market liberalization. However, a short-lived (1992-1995) advisory committee of APEC (the EPG or the Eminent Persons Group) successfully fore-grounded the liberalization agenda within APEC, even though the ambitious liberalization agenda was antithetical to most Asian members' economic policies.

While this case might demonstrate knowledge experts' (i.e. the economists in the EPG) strong epistemic influence on policy-making processes, we should not mistakenly regard their source of authority was entirely drawn from the ideas embodied by them. The liberalization move of APEC was actually momentary and was retreated after 1997. The once influential EPG was also dismissed in 1995 as many APEC economies started to have concerns about the EPG's radical proposals on liberalization measures. A discussion of the rise and demise of the EPG shows that the EPG's epistemic influence eventually depended a lot on its access to bureaucratic power and political play with APEC members. This historical process also shows whether an epistemic community can successfully transmit its knowledge to gain power in an international collaboration is circumstantial and hinges on its capability of addressing the common denominator of interests of all states. The APEC story shows that this capability has to do more with politics than with science.

Water Quality: Trends and Patterns of Macro and Microvariables, **STEFANO CIAVATTA¹, GIANPIERO COSSARINI², DONATA MELAKU CANU², ANTONIO PETRIZZO¹, COSIMO SOLIDORO², and ROBERTO PASTRES¹** (¹Department of Physical-Chemistry, Univ. of Venice, 2137 Dorsoduro, 30123 Venice, Italy; ²Istituto Nazionale di Oceanografia e di Geofisica Sperimentale OGS, Borgo Grotta Gigante 42/c, Sgonico, (TS) 34010, Italy).

This talk presents the main results of the statistical analysis of a set of water quality data that has been collected in the Lagoon of Venice, Italy, in the years 2000-2005. The work was carried out within the activities of the projects named “MELa1” and “MELa3”, which are parts of a comprehensive effort to support the integrated management of the Venice Lagoon water quality and ecosystems, promoted by the Venice Water Authority through its concessionary, the Consorzio Venezia Nuova.

The water quality monitoring network of the two projects covered, for the first time, the whole Lagoon and in-

cluded no less than 20 sampling stations and 32 macro and microvariables. The monitoring network was chosen to maximize overlap with previous ones. The sampling strategy was designed on the basis of the statistical analysis of pre-existing data and was updated in the course of the project, in order to maximize its efficiency. Univariate and multivariate statistical methods were applied to characterize spatial patterns and correlations among the pollutants, allowing us to highlight the role of the tributaries and of exchanges with the sea in determining the water quality and the ecological dynamics in the Lagoon. Moreover, the data allowed us to estimate the trends of a subset of important macrovariables, namely nitrogen, phosphorus and chlorophyll concentrations, during the last decades. This was achieved by analyzing the time series using classical techniques that allowed us to decompose the time series and identify the trends, the periodical, and the stochastic, components. Thus, it was possible to interpret the temporal variability of nitrogen, phosphorus and chlorophyll data in relation to the evolution of nutrient discharges and the meteorological dynamics the lagoon.

The Hippocampus and Remote Spatial Memory, **ROBERT E. CLARK**^{1,2} and **NICOLA J. BROADBENT**¹ (University of California San Diego, La Jolla, CA 92093; ²VA Healthcare System, San Diego, CA 92161; E-mail: reclark@ucsd.edu).

Damage to the hippocampus typically produces temporally graded retrograde amnesia, whereby memories acquired recently are impaired more than memories acquired remotely. This phenomenon has been repeatedly demonstrated in a variety of species and tasks, and it has figured prominently in theoretical treatments of memory and hippocampal function.

Studies of patients with medial temporal lobe lesions, including complete hippocampal lesions, indicate that remote spatial memory can be intact. For example, patient E.P. has been unable to acquire new spatial memories about the layout of his current house or his current neighborhood. Yet, E.P. could recall the spatial layout of his childhood neighborhood.

In the experimental animal, it is possible to identify as many as 20 studies in which animals were given equivalent amounts of training on two or more occasions before damage to the hippocampus or related structures. Of these, 16 studies found spared remote memory. Yet temporally graded retrograde amnesia has not been demonstrated following hippocampal damage in spatial tasks like the water maze.

We have conducted a series of studies that were designed to evaluate remote spatial memory in the rat following damage to the hippocampus. Our results indicate that temporally graded retrograde amnesia does not occur for spatial memory in rats with hippocampal damage. We suggest that these findings reflect impairment in the expression of spatial memory rather than damage to the storage site of spatial memory.

A Study Examining Socio-Economic Factors Associated with Absenteeism in California School Children Due to Dental Problems, **WILLIAM CRADOC**, **VALERIE MAJANO**, and **BENJAMIN FREED** (Post Baccalaureate Program, School of Dentistry, University of California, Los Angeles, Center for the Health Sciences, Los Angeles, CA 90095-1668; E-mail: wcradoc@yahoo.com, valmajano@yahoo.com, bafreed@ucla.edu).

Tooth decay is currently the single most common chronic childhood disease—five times more common than asthma. A recently published study from the Dental Health Foundation found two-thirds of children in California experience tooth decay before reaching third grade¹. The incidence of dental decay in California is above the statewide national average of 50% causing a growing concern for officials to take preventive measures for the oral health of youngsters. Major barriers to oral health include socioeconomic factors, such as lack of dental insurance or the inability to pay out of pocket, and access problems including a lack of transportation or inability for a parent to take time off work to tend to children's dental needs. These factors have a cumulative effect on a child's ability to attend school regularly. The goal of this study is to identify factors associated with children that are more likely to be absent from school due to a dental problem, in comparison to those who are not. This cross-sectional study is based on the data collected by UCLA California Health Interview Survey (CHIS) from the respondents of random-digit dialing (RDD) telephone survey conducted in California (2003). Using STATA, we tested the significance of associations between our dependent variable, absences from school due to a dental problem, with other socio-economic factors. Multivariate analysis indicates that factors such as an unmet need, lack of a dental visit within the past year, and a poor perception of general health increase the likelihood of missed school due to a dental problem.

References

1. Anderson, Troy. *No. 1 kids' epidemic: bad teeth*. Los Angeles Daily News

Reverse Causation and the Transactional Interpretation of Quantum Mechanics, **JOHN G. CRAMER** (Department of Physics, University of Washington, Seattle, WA 98195-1560; E-mail: cramer@phys.washington.edu).

The transactional interpretation of quantum mechanics is an explicitly nonlocal and relativistically invariant alternative to the Copenhagen interpretation. It requires a "handshake" between retarded waves ψ and advanced waves ψ^* for each quantum event or "transaction" in which energy, momentum, angular momentum, and other conserved quantities are transferred. The transactional interpretation offers the advantages over its alternatives that (1) it is actually "visible" in the formalism of quantum mechanics, (2) it is economical, involving fewer independent assumptions than its rivals, (3) it is paradox-free, resolving all of the paradoxes and counter-intuitive aspects of standard quantum theory in-

cluding nonlocality and wave function collapse, (4) it does not give a privileged role to observers or measurements, and (5) it permits the visualization of quantum events. Because the transactional interpretation employs back-in-time advanced waves as a vehicle for implementing nonlocal effects and the enforcement of conservation laws, it has aspects of reverse causation. We will review the transactional interpretation and consider its reverse causation implications.

Fluctuations of the Random Motion of Diathermal and Adiabatic Pistons, **BRUNO CROSIGNANI¹ and PAOLO DI PORTO²** (^{1,2}Department of Applied Physics, California Institute of Technology, Pasadena, CA 91125; ²Dipartimento di Fisica, Università dell'Aquila, 67010 L'Aquila, Italy; E-mail: bcross@caltech.edu).

The standard adiabatic-piston problem is investigated in the two extreme limiting cases in which the movable piston is respectively adiabatic or perfectly conducting (diathermal). The amplitudes of the fluctuations of random motion of the piston turn out to be much larger for an adiabatic piston than for a diathermal one. It corresponds to a relevant situation where the presence of a single massive "particle", acting as an internal constraint in a many-particle system, plays a somewhat unexpected relevant role as far as entropy is concerned. A significant physical insight accounting for this difference is gained by means of a simple application of Liouville's theorem.

Seawater Intrusion and Nitrate Dispersion in the Maneadero Aquifer, Baja California, **LUIS WALTER DAESSLÉ, KARINA LUGO-IBARRA, LEOPOLDO MENDOZA-ESPINOSA, VICTOR F. CAMACHO-IBAR** (Instituto de Investigaciones Oceanológicas, Universidad Autónoma de Baja California, Campus Ensenada, Ensenada, Baja California, Mexico; E-mail: walter@uabc.mx).

The Maneadero coastal aquifer is located ~10 km south of the city of Ensenada Baja California, Mexico. It is a major groundwater source to the city of Ensenada, and ~70% of the extracted groundwater is used for agriculture purposes in the Maneadero Valley. In response to the intensive extraction and low rainfall, groundwater is extensively mixed with seawater, with TDS 0.99 – 9.46 g/l. Seawater intrusion is progressing faster in the central and southern coastal sections of the aquifer (where recharge is less significant), and has recently affected the quality of the sites pumping water to the nearby city of Ensenada. The use of fertilizers is probably responsible for high nitrate concentrations that reach levels above the 10 mg l⁻¹ Mexican official limit (N-NO₃, as high as 35.3 mg l⁻¹). Temporal fluctuations in water quality (on a semi-yearly and yearly scale) suggest that the recharge takes places rapidly, even during short rainfall events. Consistently, tritium analyses near the recharge site (~3.5 TU) indicate a water age younger than 10 years there. The dispersion of nitrate within the aquifer is currently being modeled

using MODFLOW 4.1 with Seawat application. Despite the importance of groundwater sources in this arid region, little is known about the hydrogeochemistry of groundwater, and even less about the viability of recharge programs and/or crop irrigation with treated water.

Los Angeles Basin Water Augmentation Study: Rethinking Urban Runoff, **SUZANNE DALLMAN¹ and THOMAS W. CHESNUTT²** (¹Technical Director, Los Angeles and San Gabriel Rivers Watershed Council, 700 N. Alameda Street, Los Angeles, CA 90012; ²A&N Technical Services, 839 2nd Street, Encinitas, CA 92024; E-mail: Suzanne@lasgrwc.org).

The Water Augmentation Study, initiated in 2000, is evaluating the practical potential to improve surface water quality and increase local groundwater supplies through infiltration of urban stormwater runoff. Led by the Los Angeles & San Gabriel Rivers Watershed Council in partnership with local, state, and federal agencies, our research examines the typology of costs, feasibility and the multiple benefits of stormwater capture and infiltration: compliance with water quality standards (NPDES and TMDL); long-term impacts on groundwater quality; assessing appropriate geographic and hydro-geologic conditions for infiltration; and evaluating the benefits and costs of alternative implementing strategies for developing this potentially significant source of groundwater supply for southern California.

To assess impacts of infiltration on groundwater we have monitored water quality at six sites in the Los Angeles area for several years. Results so far indicate that infiltration is not negatively impacting groundwater at these sites. We are now estimating the potential volume of runoff that could be captured region-wide, and evaluating the costs of this "new" water supply compared with other sources of supply.

The current phase of the study is examining how infiltration approaches and other low-impact development strategies can be applied on a larger scale. Our initial analyses of parcel-specific sites generate insight on the relationship between infiltration cost-effectiveness, spatial scale, and how to best combine infiltration measures at a neighborhood level. Socially desirable levels of implementation critically turn on both the costs and the benefits that are now being examined in the current phase of the project.

New Challenges in Environmental Quality Assessment: The SIOSED Project as a Case Study in the Venice Lagoon, Italy, **DIMITRI D. DEHEYN¹ and CRISTINA NASCI²** (¹Scripps Institution of Oceanography, UCSD, La Jolla, CA USA; ²Thetis S.p.A., Environmental Studies and Analyses Division, Castello 2737/f, Venice, Italy).

Environmental quality assessment faces new challenges to become more comprehensive and representative of the real world. This implies an increasing need for multi-dimensional programs that assess the processes that govern the ecosystem. By their nature, such programs need to be

cross-disciplinary and developed over an extended period of time, which goes against the rapid and more target-specific assessment criteria one would currently use. In this paper, we present the organizational structure of the SIOSED project that assesses the environmental impact of building sub-tidal banks with dredged sediment in the Venice lagoon, Italy. SIOSED is a two-year project that involves scientists from eight different disciplines working together to identify the processes affecting the biological, chemical and physical characteristics of the sub-tidal banks. A common sampling plan to all disciplines and a sustained interaction among all participants allows unique integration of the scientific data. SIOSED is part of the multiple strategies investigated by the Venice Water Authority to include the reuse of dredged sediment in the lagoon sediment management plan.

The "SIOSED" project is part of a comprehensive effort to support the integrated management of Venice Lagoon sediments and ecosystems promoted by the Venice Water Authority through its Concessionary, Consorzio Venezia Nuova.

Sediment Quality Assessment in the Venice Lagoon: a Triad Approach, **DELANEY E.¹, BARBANTI A.¹, BERNSTEIN A.G.², BERTON A.¹, DA ROS L.³, MONTOBBIO L.², NASCI C.¹, PICONE M.⁵, and VENIER P.⁴** (¹Thetis S.p.A. - Environmental Studies and Analysis Division, Castello 2737/f, Venice, Italy; ²Consorzio Venezia Nuova, Environmental Department, S.Croce 505, 30135 Venice, Italy; ³National Research Council, Institute of Marine Science, Castello 1364/a, 30122, Venice, Italy; ⁴University of Padua, Biology Department, Via U.Bassi 58/B - 35121 Padua, Italy; ⁵University Ca' Foscari of Venice, Department of Environmental Sciences, Castello 2737/b, 30122 Venice, Italy).

In the framework of a three year monitoring project (ICSEL), promoted and financed by the Venice Water Authority, a rule-based weight-of-evidence (WOE) approach for assessing sediment quality on a site-by-site basis was carried out in the Venice Lagoon. Sediment samples were collected at different locations in the Lagoon and subjected to replicated sediment acute and chronic toxicity tests as well as comprehensive sediment chemistry analyses. Organisms collected synoptically at the same stations were analyzed for biomarkers and chemical concentrations in their tissues to determine 'in situ' alteration and bioavailability.

Benthic community data, obtained from another monitoring project (MELa2) were included in the final WOE integration. The results obtained for each component were linked to the Sediment Quality Triad using different methodologies of interpretation (univariate, multivariate analysis, best professional judgement). The main results of the project will be presented.

Copper Complexation Capacity in Surface Waters of the Venice Lagoon, **F. DELGADILLO-HINOJOSA^{1,2}, C. NASCI³, and A. ZIRINO^{2,4}** (¹Institute of Oceanographic Research, University of Baja California, Ensenada, B.C., Mexico. (E-

mail: pili@uabc.mx); ²Scripps Institution of Oceanography, MC 0202, La Jolla, CA, 92093, USA; ³Thetis S.p.A., Environmental Studies and Analyses Division, Castello 2737/f, Venice, Italy; ⁴Consorzio Venezia Nuova, 30124 Venezia, Italy).

The bioavailability of trace metals in natural waters is generally affected by their chemical forms; much of the uncertainty about the relationship between total metal concentration and toxicity to aquatic organisms results from lack of definitive knowledge of the physico-chemical properties of these metals in natural waters. Organic complexation of trace metals has been considered as the main control on bioavailability and toxicity of trace metals to phytoplankton. In general, complexation of a metal cation by organic ligands can diminish its toxicity by decreasing the free ion form of the metal.

The property of seawater that complexes metal ions has been called the complexation capacity (CC). Previous studies of metal complexation capacity in seawater have focused on the measurement of copper CC because copper is able to form rather stable complexes with organic ligands. The organic ligands responsible for Cu complexation are part of the bulk organic matter pool and have shown a positive relationship with bulk organic concentrations. Strong Cu-binding ligands can also be released by cyanobacteria in seawater and are also found in sediments.

The objective of this study was to determine the extent and spatial variability of copper complexing capacity in the Venice Lagoon. Samples were collected in July 2003 at 30 MELa 1 (Monitoraggio dell' Ecosistema Lagunare) stations as part of the regular monthly water quality monitoring program. They were placed in acid-washed polyethylene bottles, quick-frozen and shipped to the Scripps Institution, under dry ice, where they were maintained frozen until electrochemical analysis could be performed.

In the Venice Lagoon, the CuCC was correlated positively with total Cu concentration ($r = 0.78$). Comparable work done in Newport Bay, RI, showed that the concentrations of Cu complexation ligands there also increased with increasing total Cu concentrations in a molar ratio close to 1:1. On the other hand, in the Venice Lagoon, this molar ratio was 4:1, suggesting that a large excess of complexation capacity exists there. This ratio is in better agreement with the ratio of 5:1 found in Galveston Bay, which is a shallow lagoon hydrographically more similar to the Venice Lagoon. This excess of binding capacity may suggest that the organic ligands are not necessarily specific to Cu but may also bind other trace substances.

Activating the Curriculum: Evaluating the Success of Curriculum Changes, **DOUGLAS H. DEUTSCHMAN** (Department of Biology, San Diego State University, San Diego, CA 92182-4614; E-mail: doug@sciences.sdsu.edu).

Over the past 8 years, I have been involved in revising

an updating the curriculum for a large class required of all biology majors. Enrollment averages 140 students per semester and includes two hour of "lecture" and 3 hours of computer laboratory (max 28 students each). Over the years, we have implemented frequent in-class assessment, small group activities, writing assignments in lecture and revised the allocation of responsibilities for the lecture and the laboratory portion of the class. I will discuss the successes and challenges based on my experience and student evaluations and comments.

Retrocausal Information Flow: What Are the Implications of Knowing the Future? **YORK DOBYNS** (Princeton Engineering Anomalies Research, C-131 Engineering Quad, Princeton University, Princeton, NJ 08540; E-mail ydobyns@princeton.edu).

This paper discusses experimental findings from the Princeton Engineering Anomalies Research project supporting the existence of retrocausal information flow. Possible alternative explanations to retrocausation are examined for each experiment. In each case it can be shown that retrocausal information flow is either the most parsimonious explanation, or the only currently available explanation, for the observational data. Gedankenexperiments are then examined to demonstrate that regardless of observational effect size, empirical phenomena of the type seen in these experiments cannot produce time paradoxes.

The theoretical discussion pursuant to the experimental data covers some of the basic problems in the physical representation of time. Human perception of time incorporates a dichotomy: the past is known but cannot be changed, the future is presumed to be indeterminate and hence controllable but unknowable in advance. Physical formalisms have difficulty in representing this dichotomy, arriving in the most extreme case at the completely deterministic Einsteinian block universe view of spacetime. Strict physical determinism, however, currently seems implausible due to apparently essential indeterminism at the quantum scale.

Retrocausal phenomena attack the dichotomy on empirical rather than theoretical grounds, since if past events can be causally influenced by future events either the past is malleable or the future is knowable. This approach allows a resolution of the past/future dichotomy by additional approaches other than strict determinism: the past may be indeterminate, or both past and future can contain a mixture of deterministic and indeterminate events.

Aerosol Formation and Processing from Reactions of Unsaturated Organic Compounds with Nitrate Radicals, **KENNETH S. DOCHERTY, HUIMING GONG, AIKO MATSUNAGA, and PAUL J. ZIEMANN** (Air Pollution Research Center, University of California, Riverside, CA 92521; E-mail: paul.ziemann@ucr.edu).

Atmospheric aerosol particles consist of a complex

mixture of inorganic and organic material, and range in size from less than a nanometer to hundreds of micrometers. They influence the chemistry of the atmosphere, visibility, global climate, and human health. The organic components of particulate matter are either emitted directly to the atmosphere (primary organic aerosol, POA), mainly from combustion sources, or they are formed in situ by condensation of low-volatility products of the reactions of volatile organic compounds with hydroxyl radicals, nitrate radicals, or ozone (secondary organic aerosol, SOA). POA and SOA can be further transformed by heterogeneous reactions with the same oxidants. Reactions with hydroxyl radicals occur almost exclusively during the day, reactions with nitrate radicals occur primarily at night, and reactions with ozone occur during the day and at night. The mechanisms of these reactions can be highly complex, and are not yet well understood. In this talk, I will describe our recent laboratory studies aimed at identifying the products and elucidating the mechanisms of reactions of unsaturated organic compounds with nitrate radicals in both the gas and particle phases. Experiments are performed in a large-volume environmental chamber and particles are analyzed using a suite of methods, including a home-built thermal desorption particle beam mass spectrometer. The results provide insight into these particular chemistries, but also have implications for understanding many other organic oxidation reactions involved in the formation and processing of atmospheric organic particles.

Adult Attachment and Declining Birthrates, **THOMAS W. DRAPER and THOMAS B. HOLMAN** (School of Family Life, Brigham Young University, Provo, UT 84602-6720; E-mail: draper@byu.edu).

Many modern societies are experiencing demographic changes. The birthrate in seventeen European nations is around 1.3 births per woman, well below the 2.1 needed to sustain growth at a replacement level. With a birthrate of 1.3, populations will theoretically halve every 40 years, though in actuality, population vacuums likely will be filled by immigration. We hypothesize that low levels of adult attachment will contribute to even more rapid demographic changes in developed societies than those projected by birthrate and immigration alone. That is, some young adults who lack strong attachments to their families of origin and their culture will find it easier to emigrate rather than pay the geometrically increasing taxes necessary to keep the retirement promises of their social welfare states.

Among other things, adult attachment has been defined as expecting others to respond positively, seeking intimacy, and taking responsibility for others (Simpson & Rholes, 1998). Studies have supported the argument that adult attachment has some of its roots in infant attachment and in the parenting practiced in ones family of origin (cf. Griffin & Bartholomew, 1994). One part of the adult attachment hypothesis is that birthrates will be higher in areas where adult

attachment is stronger.

Attachment scores (Brennan, Clark, & Shaver, 1998) for 300 18 to 30 year-olds from Utah County, UT, USA, (birthrate 3.8) were compared to the adult attachment scores for 300 18 to 30 year-olds from throughout the USA (birthrate 2.1). All of the participants had voluntarily taken the online RELATE relationship assessment for romantically involved couples. A canonical correlation analysis supported the view that adult attachment and birthrate are linked ($r = .361$). While this finding is not sufficient to indicate a causal link, it is consistent with the hypothesis.

Information Loss as a Foundational Principle for the Second Law, **TODD DUNCAN¹ and JACK SEMURA²** (¹Center for Science Education, Portland State University, P.O. Box 751, Portland, OR 97207; ²Department of Physics, Portland State University, P.O. Box 751, Portland, OR 97207; E-mail: duncant@pdx.edu).

In a previous paper (*Entropy* 2004, 6, 21-29) we considered the question, "What underlying property of nature is responsible for the second law?" A simple answer can be stated in terms of information: The fundamental loss of information gives rise to the second law. This line of thinking highlights the existence of two independent but coupled sets of laws: Information dynamics and energy dynamics. The distinction helps shed light on certain foundational questions in statistical mechanics. The confusion surrounding previous "derivations" of the second law from energy dynamics can be resolved by noting that all such derivations incorporate an assumption that corresponds to the loss of information. In this talk we will explore some of the implications of viewing information loss as the foundational principle for the second law.

From Brain Dynamics to Consciousness: How Matter Becomes Imagination, **GERALD M. EDELMAN** (The Neurosciences Institute, 10640 John Jay Hopkins Drive, San Diego, CA 92121; E-mail: stotts@nsi.edu).

Prevalent views of higher brain functions are based on the notions of computation and information processing. These views suggest that the brain is a Turing machine. Various lines of evidence appear to be incompatible with this position and suggest instead that the brain operates according to a set of selectional principles. A theory addressing these principles, called Neural Darwinism, will be discussed. Neural Darwinism has a direct bearing on the search for neural correlates of consciousness. Most approaches to the understanding of consciousness are concerned with the contributions of specific brain areas or groups of neurons. By contrast, I will consider what kinds of neural processes can account for key properties of conscious experience such as its unity and its diversity, and I will present supporting evidence on the neural correlates of consciousness obtained from MEG studies of human subjects.

Random Events as Agents of Time's Arrow, **AVSHALOM C. ELITZUR¹ and SHAHAR DOLEV²** (¹Bar-Ilan University, Israel; ²Hebrew University, Israel).

Every novice in physics knows that an ordinary entropy increasing process does not depend on initial conditions whereas the time reversed process, where entropy decreases, is extremely susceptible to any change in initial conditions. From this fact it rigorously follows that if quantum hidden variables do not exist, then the thermodynamic arrow of time is intrinsic to any process, regardless of its initial conditions.

Retrocausal Quantum Measurement: Some New Findings and Their Interpretation, **AVSHALOM C. ELITZUR¹ and SHAHAR DOLEV²** (¹Bar-Ilan University, Israel; ²Hebrew University, Israel).

Quantum measurements that retroactively determine a past state are well known, such as the delayed-choice experiment. Some argue that all the peculiarities of quantum measurement, such as those manifested in the double slit and the EPR experiment, can be explained in terms of retrocausality. We present some striking experiments in which the retroactive aspect is manifested more strongly than in all previous cases, presenting a history that is inconsistent with itself. We conclude with a proposed outline of a unified quantum-relativistic theory based on these findings.

A Reevaluation of the Origin of the Fish Creek Gypsum, **DAVID ESCAMILLA** (San Diego High School, 1405 Park Blvd. San Diego Ca. 92101; E-mail kiwi7166@yahoo.com).

Fish Creek Gypsum (FCG) includes gypsum, anhydrite and celestite that were deposited during late Miocene to early Pliocene in the northern part of the rifting proto-Gulf of California basin. The FCG has been interpreted to be a non-marine evaporite (Winker 1987), a marine evaporite (Diblee 1954; Stump 1972; Dean 1988; Kerr et al. 1991), and as a marine hydrothermal vent precipitate associated with rifting tectonics (Peterson 1997).

This study re-examines the origin of the FCG through field, mineralogical (X Ray Diffraction), petrographic and geochemical analyses of trace elements (Cu, Pb, Zn, Fe, Ni, Mn and Sr, by Atomic Absorption Spectrometry), chemically bound water (loss on ignition), and sulfur and oxygen isotope values (stable isotope mass spectrometry). The results from this work were compared to reported data from evaporites of known hydrothermal origins, and to a sedimentary evaporite.

Results suggest that some trace elements in anhydrites and celestites from FCG are slightly higher than values expected from marine sedimentary evaporites. In several cases the trace element concentration values overlap among the FCG samples and sedimentary and hydrothermal samples reported in the literature. Textures and minerals observed under petrographic microscopy show slight evidence of hy-

drothermal or metamorphic alteration. However, the FCG textures may have been obscured by diagenetic processes.

These data support a complex origin for the FCG that involves more than one process of formation. The FCG may have precipitated from a mixture of several different types of waters, including marine and hydrothermal fluids as well as meteoric waters. Alternatively, these data could reflect secondary overprinting of a hydrothermal signature on primary evaporate sulfates.

Regional Planning for the Guadalupe Valley, Baja California, Mexico, ILEANA ESPEJEL, CLAUDIA LEYVA, BRENDA AHUMADA, GUILLERMO ARAMBURO and DAGOBERTO ALVARADO (School of Sciences, University of Baja California, Ensenada 22860 Baja California, MX; E-mail: ileana@uabc.mx).

Historically, the Valley of Guadalupe economy has turned around the agricultural activity of crops of Mediterranean origin. It is the only Mexican region with the propitious climate for the culture of grapevine, olive tree, carob tree and herbs. Here, 95% of table wines of the country take place. In the last years economic and social pressure has exerted great on the area, because social conflicts derived from internal and external interests. Local population growth and second residences for American and wealthy Mexican citizens demand spaces for urbanization, threatening the unique landscape conservation and the main attributes which they characterize to the zone. Regional ordinances are the Mexican legal instruments to prevent conflicts among land uses. This research presents our results of a regional ordinance which pretends to cope the agricultural vocation of the valley with other land uses (including no land uses such as protected areas). In its formulation, we considered the values, necessities and priorities of all the social actors, given the need to conciliate different interests, which is translated in technical and political difficulties. Consequently, it includes viable and verifiable actions, materialized through the of ecological ordinance model. A monitoring scheme to evaluate the success of failure of such regional ordinance is presented for the valley itself (local scale) and for the watershed where the valley is immersed (regional scale).

Characterization of a Blood Meal Responsive Amino Acid Transporter in the Disease Vector, Aedes aegypti, A.M. EVANS, L.S. ROSS, and S.S. GILL (Department of Cell Biology and Neuroscience, University of California, Riverside, CA).

After mosquitoes ingest the required blood meal for oogenesis, proteins are rapidly degraded yielding a large pool of amino acids. Since these amino acids are the primary energy source for egg production, transport processes are required for the amino acid uptake into midgut epithelial cells. We identified a putative amino acid transporter, designated AQ16 (accession number CB690768), in a midgut/Malpi-

ghian Tubules EST library. AQ16 encodes a 475 amino acid protein showing high similarity to *Anopheles gambiae* gene XP_319018, which is a proton amino acid transporter. AQ16 demonstrated transport of many amino acids, including alanine, glutamine, proline, serine, and tryptophan. Transcript levels of AQ16 were also shown to be highly induced after ingestion of a blood meal. Based on transport properties and gene expression patterns, AQ16 is likely to be an important transporter in the uptake of amino acids derived from the blood meal.

Interactions of Nitrate Aerosols with Biogenic Organic Compounds, EZELL, M.J., YU, Y., MCINTIRE, T.M., D'ANNA¹, B., and FINLAYSON-PITTS, B.J. (Department of Chemistry, University of California, Irvine; ¹Laboratoire d'Application de la Chimie à l'Environnement, Villeurbanne Cedex, France; E-mail: mezell@uci.edu).

Unlike the sulfuric acid molecule or sulfate ion, which exhibit no photochemistry of atmospheric interest, nitrate ion has complex photochemistry. Thus, air-borne particles containing nitrate ion may serve as a source of oxidants for volatile organic compounds and lead to formation of secondary organic aerosols. In our studies, a variety of techniques have been used to examine the effects of organics on the chemistry, photochemistry and physical properties of deliquesced nitrate aerosol particles. Alpha-pinene was chosen as a representative biogenic organic compound. Nephelometer and SMPS measurements combined with Mie scattering calculations have been used to examine the effects of organic / inorganic on the light-scattering properties of the aerosols in the dark as well as after irradiation. Particle morphology was examined using atomic force microscopy and scanning electron microscopy. The chemical composition of the particles was analyzed using GC-MS and EDX. Mechanism of interaction of the parent organic with the nitrate particles, including the potential for reactions at interfaces, and the atmospheric implications will be presented.

Phytoplankton and Microphytobenthos in the Venice Lagoon: Comparisons of Abundance, Taxonomic Composition, and Productivity, FACCA C.¹, BAZZONI A.M.¹, COPPOLA J.¹, HEWES C.², HOLM HANSEN O.², and SOCAL G.¹ (¹Institute of Marine Science (ISMAR CNR) Castello 1364/a 30122 Venice. Italy; ²Scripps Institution of Oceanography La Jolla, CA 92093 San Diego. USA; E-mail: chiara.facca@tin.it).

In estuarine systems, the role of microphytobenthos is often underestimated. Recent research of various lagoons worldwide have demonstrated the importance of the epipellic and epipsammic species as contributors to biodiversity both in surface sediments and, after re-suspension, the water column. Within the framework of a project to examine toxicity of local sediments on biological communities in the lagoon of Venice, Italy (SIOSED project), we focus on the influence of sediments upon the physiology of autotrophic microor-

ganisms. Samples have been obtained from several locations during seasonal campaigns in the Venice Lagoon since June 2005, to investigate the abundance, species composition, and primary production of phytoplankton and microphytobenthos communities. Observations and cell counts by microscopy were done along with size-classed chlorophyll concentration that supported the experimental work. Phytoplankton size distributions vary with respect to location in the lagoon and to different seasons. Water column cell abundances (determined by Utermöhl methodology) were $0.2\text{--}5.3 \times 10^3$ cells/ml. Surface sediment cell abundances were $1.2\text{--}6.5 \times 10^6$ cells/ml. Nanoflagellates ($<20 \mu\text{m}$ diameters) dominated communities of both the water column and the sediments. Diatoms were the next most abundant taxa, and included *Chaetoceros spp.*, *Cyclotella spp.* and *Skeletonema marinoi* in the water column, and *Navicula spp.*, *Nitzschia spp.*, *Cocconeis scutellum* and *Thalassiosira sp.* from surface sediment. Dinoflagellates and coccolitophorids were found to be negligible. Prokaryotic autotrophic picoplankton ($<2 \mu\text{m}$ diameters) were found most abundant at the inlets into the Venice Lagoon. Primary productivity had a marked seasonal variability, being on average of $18.7 \pm 11.0 \text{ mg C m}^{-3} \text{ h}^{-1}$, and correlated to chlorophyll concentration (significant for $p < 0.01$). Our preliminary results indicate that primary production is reduced when natural populations are exposed to polluted surface sediments.

The "SIOSED" project is part of a comprehensive effort to support the integrated management of Venice Lagoon sediments and ecosystems promoted by the Venice Water Authority through its Concessionary, Consorzio Venezia Nuova.

Individually Different Brain Responses, **MANFRED FAHLE** (Universitaet Bremen, Argonnenstrasse 3, D-28211 Bremen, Germany; E-mail: mhale@uni-bremen.de).

Biological sciences are usually not interested in differences between individuals. Quite the contrary, these differences are considered to be a nuisance that adds noise to the measurement. This noise must be cancelled out by making the sample size larger. The general consensus will probably be that individuals differ in intellectual and emotional characteristics which are higher in complexity than in "lower level" brain function such as perception, in which, supposedly, the individuals are mostly identical.

In contrast, our aim is to stress the fact that the study of differences among individuals may lead to the discovery of distinct individual types even at the level of perception. In this paper, we demonstrate that two different measurement methods yielded the same conclusion that the same stimuli produced clearly differing patterns of cortical activation in different individuals. The differences between individuals are significantly larger than the variations within each individual in repeated experiments over time. In other words, each person is consistently different from other persons.

Two types of experiments were performed: (a) VEP recordings (visually evoked cortical sum potentials voltages);

(b) fMRI (functional Magnetic Resonance Imaging [to the editor and typesetter: Do not capitalize "f".]) The age of tested individuals ranged between 23 and 39 years, with about equal gender distribution.

Recombinant Bacterial Larvicides for Improving Control of Nuisance and Vector Mosquitoes, **BRIAN A. FEDERICI, HYUN-WOO PARK, DENNIS K. BIDESHI, MARGARET C. WIRTH, JEFFREY J. JOHNSON, YUKO SAKANO, MUJIN TANG and WILLIAM E. WALTON** (Department of Entomology and Interdepartmental Graduate Programs in Genetics and Microbiology, University of California, Riverside, Riverside, California 92521; E-mail: brian.federici@ucr.edu).

New agents are needed to control mosquito vectors of malaria, filariasis, and virus encephalitides. The larvicidal bacteria *Bacillus sphaericus* (Bs) and *B. thuringiensis* subsp. *israelensis* (Bti) hold promise, but use is limited by their high cost. Moreover, mosquito resistance has evolved rapidly to Bs where used intensively. Toxicity of these bacteria is due, respectively, to a single binary protein (BsB) in Bs, and four proteins in Bti, Cry4A, Cry4B, Cry11A, and Cyt1A. Cyt1A is of particular importance because it synergizes Cry toxicity and delays resistance to. Additionally, Cyt1A suppresses resistance to Bs and expands its target spectrum. Recently, we used *cyt1A* promoters and a 5' mRNA stabilizing (STABSD) sequence to synthesize high levels of the Bs2362 binary toxin in Bti. The Bti/BsB recombinant ($LC_{50} = 0.37 \text{ ng/ml}$) was the most toxic of these against fourth instars of *Culex quinquefasciatus*, a West Nile virus vector, making it 21 times as toxic as Bti ($LC_{50} = 8.1 \text{ ng/ml}$), and 32 times as toxic as Bs2362 ($LC_{50} = 11.9 \text{ ng/ml}$). Moreover, Bti/BsB completely suppressed extremely high resistance ($>100,000$ -fold) to Bs2362 in this species. This and other recombinant bacterial insecticides should be highly effective against *Culex* vectors and much less prone to resistance due to their high toxicity and endotoxin complexity combined with Cyt1A's synergistic and resistance-delaying properties. High sensitivity of important malaria vectors, such as *Anopheles gambiae* and *An. arabiensis* to Bs indicates that these recombinants should significantly reduce material costs for controlling anophelines where larvicides are used to reduce populations.

Introduction to and Overview of Programmatic Assessment and Diagnostic Tests, **KATHLEEN M. FISHER** (Biology, Center for Research in Math & Science Education, San Diego State University, 6475 Alvarado road Suite 206, San Diego, CA 92120; E-mail: kfisher@sciences.sdsu.edu).

Universities are increasingly being asked to evaluate the effectiveness of their educational programs, a process known as programmatic assessment. The challenge is how to do this well. A major issue, discovered in the early 1980's, is that our established educational practices can often undermine the possibilities for meaningful long-term learning by stu-

dents. One-way transmission of information (lectures) and instructor-designed multiple-choice testing encourage a lot of memorization (often followed by forgetting). One approach to programmatic assessment of student learning progress would be to use professionally developed evaluations from sources such as the Educational Testing Service, given at regular intervals during the four-year course of study. However, few institutions can afford to do this. This symposia addresses an alternative approach involving the development, administration, and analysis of diagnostic tests given at the beginning and end of each semester. Dianne Anderson will describe the steps involved in developing and evaluating a diagnostic test. Bryce Battisti will describe an emerging statistical approach for deep analysis of the data that can provide insights into how to best organize the curriculum. And Kathy Williams will describe an ongoing programmatic assessment program in biology at SDSU that makes use of these features. She will also talk about an on-line test administration program she has been developing with Educational Technology, since BlackBoard, ParScore, and ScanTron are all quite inadequate for these purposes.

A New Quantitative Behavioral Index of Brain Function Based on Perseveration in Personality Inventory Responses, **ALLAN H. FRANKLE** and **PHILLIP F. WROBLEWSKI** (2897 Via Posada, La Jolla, CA; E-mail: docesem@aol.com).

A substantial degree of perseveration, a tendency to repeat the same response beyond the point where it is adaptive or appropriate to the stimulus, is a direct indicator or "sign" of brain disorder. Although perseveration and its significance have been known to neurologists and psychologists for more than a century, it has not often been utilized to detect brain disorder because it has been difficult to measure accurately.

The authors have discovered a new method for measuring a subject's tendency to perseverate

that is very simple to administer, score and interpret. It uses a brief, True-False personality inventory (Lanyon's Psychological Screening Inventory) in a radically different way, by examining sequences of responses for Acquiescent Perseveration, i.e., "runs" of True responses 3 or longer. No scoring key or stencil is needed to obtain a quantified measure of the subject's tendency to perseverate.

This test procedure is capable of differentiating heterogeneous groups of patients with mild to moderate brain disorders from seriously disturbed psychiatric patients. Our most recent scoring algorithm detects approximately 80% of 120 patients with various kinds of organic brain damage while misidentifying fewer than 5% of 47 psychiatric patients as false positive organics.

Three different personality inventories have proved suitable for measuring perseveration. It is by no means a "chance" phenomenon unique to just one inventory.

Perseveration appears to hold promise for a variety of applications in Neuropsychology and in personnel selection,

significantly extending the power of psychological measurement.

Ethical and Policy Complexities in Current Embryonic Stem Cell Research, **T. FRIEDMANN** (University of California San Diego School of Medicine, La Jolla, CA 92037; E-mail: tfriedmann@ucsd.edu).

The discovery of mammalian embryonic stem cells has provided opportunities for conceptual breakthroughs in the understanding and treatment of many human diseases. As in the case of many new concepts in biomedicine, the promise inherent in the technology at times comes to be shaped by many factors, including urgent medical needs of the public, the legitimate enthusiasm of the research community, commercial interests and public policy. The recent history of stem cell research has seen impressive scientific advances as well as confounding missteps in the ways the enormous potential of this new area of biomedicine has been presented to and perceived by the public and has been directed by confusing and at times inadequately-informed public policy, particularly at the federal level. Delivery of this important technology to the public good will be facilitated by more extended and rigorous research and less self-serving at all levels.

An Efficient, Semi-Implicit Finite Element Model to Simulate Tidal Propagation and Solute Dispersion in the Venice Lagoon, **ANDREA GARZON** (CREA, S.r.l., 37138 Verona, Italy).

This model was developed to solve the shallow-water equations in areas with large intertidal flats. The flexibility of finite elements allows accurate representation of the extremely complex geometry of the lagoon, in which deep morphological incisions (channels) furrow, wide, flat, areas. The two-level semi-implicit calculation procedure makes it possible to reduce computational effort, despite the large number of nodes and elements necessary to outline accurately the complex lagoon hydrodynamic system. Moreover, the solutions to the shallow-water equations are calculated at the nodes of the finite elements, resulting in a continuous field of motion in the integration domain. The model conserves both mass and energy, nevertheless, to obtain optimum results, the finite-element schematization of the flow field must also represent the physical flow field accurately. The model furnishes flow velocities to a coupled dispersion model that is being used to simulate daily and monthly temperatures and salinities in the lagoon.

Levels of Hepatitis A Virus and Enterovirus in the Lagoon Canals and Lido Beach of Venice, Italy, **RICHARD M. GERSBERG¹**, **MICHAEL A. ROSE¹**, **ARUN K. DHAR²**, **HILARY A. BROOKS¹**, and **FULVIO ZECCHINI³** (¹Graduate School of Public Health, San Diego State University, San Diego, CA 92182, USA; ²Department of Biology, San Diego State University, San Diego, CA 92182, USA; ³Labo-

ratorio di Analisi di Microbiologia Ambientale (L.A.M.A.), Consorzio Interuniversitario Nazionale "La Chimica per l'Ambiente" (I.N.C.A.) Via delle Industrie, 21/8, I-30175 Marghera Venezia, Italy).

In order to assess the microbial water quality of the lagoon canals of Venice, Italy, and the nearby beach on Lido island, a study was conducted using real-time RT-PCR to enumerate levels of hepatitis A virus (HAV) and enteroviruses in these marine waters over a three year period from 2003 to 2005. A total of 17 sites (9 lagoon canal and 8 beach sites) were assayed. For the canals of the Venice Lagoon, 78% were 3-1e positive for both HAV and enteroviruses, with levels ranging from 75-730 genome copies/L and 614 genome copies/L, respectively. At Lido beach, HAV was never detected, but enteroviruses were detected in all Lido beach samples at levels ranging from 2-71 genome copies/L. There was a statistically significant correlation between thermotolerant (fecal coliform) coliform densities and HAV levels ($p=0.001$), but the relationship between thermotolerant coliform densities and enterovirus levels was not significant ($p>0.05$). Despite the fact that enteroviruses were detected at low levels in the surfzone at Lido beach, the risk for enteroviral infection (calculated using the beta-Poisson model) for recreational exposure from swimming, was in the range of 1.9×10^{-3} to 6.1×10^{-2} , yielding a disease risk at or below the level (5% for gastroenteritis) deemed acceptable by European Guide standards.

A Novel Evolutionary Solution for Generating Binding Diversity, and Its Applications, **PARTHO GHOSH** (Department of Chemistry and Biochemistry and Section of Molecular Biology, 0375 Natural Sciences Building, Room 3105, University of California, San Diego, 9500 Gilman Drive, La Jolla, CA 92093-0375; E-mail: pghosh@ucsd.edu).

Only a few instances are known of protein folds that tolerate massive sequence variation for the sake of binding diversity. The most extensively characterized is the immunoglobulin (Ig)-fold of antibodies and T-cell receptors. Now added to this is the C-type lectin (CLec)-fold, which was found unexpectedly in major tropism determinant (Mtd), a retroelement-encoded receptor-binding protein of *Bordetella* bacteriophage. The $\sim 10^{13}$ possible sequences of Mtd enable the phage to utilize a variety of *Bordetella* surface receptors for infectivity. Mtd is a pyramid-shaped, intertwined trimer, with variable residues organized by its CLec-fold into discrete receptor-binding sites. Structural principles in the CLec- and Ig-folds for tolerating massive sequence variation differ strikingly, and likely reflect alternative evolutionary solutions for balancing diversity against stability. The stability of Mtd along with its simple and high-level production as a soluble protein in *E. coli* raise the possibility that it may be useful in diverse applications requiring selectable binding specificity.

Vertical Oceanic Heat, Mass, Momentum, and Information Transport by Beamed Fossil and Zombie Turbulence Maser Action Mixing Chimneys, **CARL H. GIBSON** (Departments of Mechanical and Aerospace Engineering and Scripps Institution of Oceanography, University of California at San Diego, La Jolla, CA 92093-0411, USA; E-mail: cgibson@ucsd.edu).

Results are presented from sea tests of remote sensing methods of submerged turbulence by Russian colleagues. Radar and optical satellite images showed sea surface brightness anomalies attributed to the Honolulu Sand Island municipal outfall extending up to 40 km south of Oahu island. From vertical and horizontal microstructure profiles during three years of the international study, the physical mechanism appears to be generic to vertical transport processes in stratified fluids of the ocean, atmosphere, and astrophysical objects. Turbulence is defined as an eddy-like state of fluid motion where the inertial-vortex forces of the eddies are larger than any other forces which tend to damp the eddies out. Turbulence always cascades from small scales to large. For stratified fluids, turbulence rapidly fossilizes at the Ozmidov scale, and for high Reynolds number oceanic turbulence events triggered by bottom topography, most of the turbulent kinetic energy is radiated near vertically as fossil turbulence waves in an efficient maser action. Vertical transport of information and oceanic properties is enhanced by secondary (zombie) turbulence forming on outfall fossil turbulence patches, fossilizing, and radiating zombie turbulence internal waves near vertically so channels can form for the vertical fossil turbulence wave beams termed mixing chimneys.

Pore Fluid Studies of Sediments from Venice Lagoon: Importance for Ecological Studies of SIOSED, **JORIS M. GIESKES¹, SEUNGHEE HAN¹, and ANTHONY RATHBURN^{1,2}** (¹Scripps Institution of Oceanography, UC San Diego, 9500 Gilman Drive, La Jolla, CA, 92093-0218, E-mail: jgieskes@ucsd.edu, s7han@ucsd.edu; ²Geography, Geology, and Anthropology, Indiana State University, Science Building 159, Terre Haute, IN 47809, E-mail: gerathblu@isugw.indstate.edu).

We present the pore fluid geochemistry of sediments in the Venice Lagoon, with the purpose of describing the nature of the fluids underlying the lagoonal waters. Towards this purpose we have studied so-called long cores of ~ 150 cm length as well as short cores of ~ 20 cm length. In addition we have obtained pore fluids from a 30 m long drill hole in the Porto Marghera section of the lagoon.

With the building of special banks in the lagoon south of the city of Venice, we have studied in particular the sediments of 2 bank sites V1 and V2. These banks were built with the purpose of environmental studies and were constructed with sediment dredged from Station SSO in a Lagoon Channel near the Ravaggio Inlet of Venice. As a result the upper 70

cm of the banks are characterized by a very different chemistry from the underlying sediments. We emphasize in particular the nature of the pore fluids in the banks with special emphasis on potential effects on biota living in or near the sediment water interface.

The results of our studies on a 30 meters long drill hole allow us insights on potential influences of groundwater flow beneath the lagoon and on the pore water chemistry of the lagoon's sediments.

This work is a component of the "SIOSED" project, a part of a comprehensive effort to support the integrated management of Venice Lagoon sediments and ecosystems promoted by the Venice Water Authority through its Concessionary, Consorzio Venezia Nuova.

Clinical Research Ethics – International Protection of Human Subjects, **THOMAS GIONIS¹** and **ERIC HOWARD²** (¹American Board of Healthcare Law & Medicine, Newport Beach, CA; ²Fulbright Academy of Science & Technology, PO Box CC-284, Cape Elizabeth, ME 04107-0284; E-mail: tgionis@aol.com).

The Joint Study Committee on Clinical Research Ethics (JSCCRE) was established early in 2006 with the goal of expanding our understanding of ethics as it relates to international protection of human subjects during clinical research and experimentation. International research has become much more common in recent years. As a result, the topic of international legal protections for human subjects of clinical research is particularly important and germane, especially for those who design and engage in research and experimentation in foreign countries.

International protections developed in response to well-known abuses, such as medical experiments conducted during World War II. The scope of these international instruments continues to evolve in response to changes in scientific practice and changes in the humanities – how we perceive ourselves and our society. Some examples are given below

Who is responsible for giving consent to participate in a study: the individual, the immediate family, or the community? Who defines what is considered "family"?

Should the "standards of care" of developed countries be promulgated worldwide, and how responsive should researchers be to the health needs of the host country? The dollars spent on research to develop a medicine for the wealthy might have saved many more lives if invested elsewhere. Is that just?

Effects of Controlled Oxidation and Reduction of Carbon Nanotubes, **BRETT R. GOLDSMITH**, **YUWEI FAN**, **ALEX KANE** and **PHILIP G. COLLINS** (Department of Physics and Astronomy, University of California at Irvine, 4129 Frederick Reines Hall, Irvine, CA 92697-4575; E-mail: collinsp@uci.edu).

The prevailing conception of carbon nanotubes and particularly single-walled carbon nanotubes (SWNTs) continues to be one of perfectly crystalline wires. We have examined

a number of electronic devices in which single defects play important roles in determining the two- and three-terminal device behavior. Scanned probe microscopy techniques are particularly useful for identifying these sites and then examining their electronic properties. We have also demonstrated a selective electrochemical method which labels point defects and makes them easily visible for quantitative analysis. High-quality SWNTs are confirmed to contain one defect per 4 μm on average. While this defect density compares favorably to high quality, silicon single crystals, the presence of a single defect can have tremendous electronic effects in one-dimensional conductors like SWNTs. We demonstrate a one-to-one correspondence between chemically-active point defects and sites of local electronic sensitivity in SWNT circuits, confirming the expectation that individual defects may be critical to understanding and controlling variability, noise, and chemical sensitivity in SWNT electronic devices.

Photo-polymerization of Aqueous Pyruvic Acid, **M. I. GUZMÁN**, **A. J. COLUSSI**, and **M. R. HOFFMANN** (W. M. Keck Laboratories, California Institute of Technology, Pasadena, California 91125; E-mail: mrh@caltech.edu).

The 320 nm-band photodecarboxylation of aqueous pyruvic acid (*PA*), a representative of the α -oxocarboxylic acids widely present in natural waters, yields hitherto unidentified thermolabile, multifunctional products. New, ^{13}C -NMR signals appear at $\delta^{13}\text{C} \sim 80$ ppm during the photolysis of *PA* solutions, which correspond to the polyfunctional ethers: 2-(3-oxobutan-2-yloxy)-2-hydroxypropanoic (*A*) and 2-(propanoic-2-yloxy)-2-hydroxypropanoic acids (*B*), identified by HPLC with UV and ESI MS detection. These techniques show that 3-hydroxy-2-oxobutanone is not a photoproduct, at variance with previous reports, but an artifactual species produced during conventional GC-MS analysis of reaction mixtures. A peculiar radical mechanism seems to underlie the title process, in which: (1) CO_2 formation rates are only halved, while *A* and *B* are fully quenched, by the addition of >1.5 mM TEMPO and, (2) *A* and *B* are partially quenched by < 1 atm O_2 . These observations are consistent with a process initiated by photoinduced electron transfer between adjacent *PA*'s, rather than with mechanisms proceeding via 1-hydroxyethylidene [$^3\text{CH}_3\text{C}(\text{OH}):$] ($+\text{CO}_2$), or $^3[\text{CH}_3\text{C}(\text{O})\cdot\text{COOH}]$ radical pairs. Deprotonation of the photogenerated radical cations, PA^+ , which is followed by ultrafast decarboxylation of the resulting acyloxyl radicals, accounts for the unquenchable CO_2 fraction. The radical anions, PA^- , protonate into ketyl radicals (and/or their distonic forms) that recombine into *B*, or rapidly add to *PA* en route to a β -ketoacid: 2-(1-carboxy-1-hydroxyethoxy)-2-methyl-oxobutanoic, that readily decarboxylates into *A*. Since the radical precursors to *A* and *B* are scavenged by O_2 with a low probability per encounter, *PA* is able to accrete into multifunctional polar species in aerated aqueous media under solar illumination.

Schrödinger Equation for Joint Bidirectional Evolution in Time, **GERHARD E. HAHNE** (P. O. Box 2748, Sunnyvale, CA 94087; E-mail: ghahne@mail.arc.nasa.gov).

A straightforward extension of quantum mechanics and quantum field theory is proposed that can describe physical systems comprising two interacting subsystems: one subsystem evolves forward in time, the other, backward. The space of quantum states is the direct sum of the states representing the respective subsystems, whereupon there are two linearly independent vacuum states, one each for the forward and the backward subspace. An indefinite metric is imposed on the space of quantum states such that purely forward (respectively, purely backward) states have positive (respectively, negative) norms. Hamiltonians are self-adjoint operators with respect to the metric, such that interactions/transitions between the subspaces can be accounted for. Given suitable definitions of input and of output states at the two ends of a time interval, input and output states separately have positive norms such that probability is conserved, and hence SSS-matrices are unitary. A discussion of the physics entailed in the proposed formalism is undertaken. Then as an application, a simple model of a relativistic quantum field theory is proposed. In this theory, the expected vacuum energy (thought to be associated with the cosmological constant) almost vanishes for most times in an interval due to cancellation of the energies of the forward and backward vacuum states; this cancellation holds whatever be the input vacuum state at the ends of the time interval. Proposals for further research conclude the report.

Use of Monoclonal Antibodies 11H and 12A in the Characterization of a Tumor Associated Antigen on 9L Gliosarcoma, **CAREN HALL, JANELL KNAUFF, and JOAN REDD** (Department of Biological Sciences, Walla Walla College, College Place, WA 99324; E-mail: hallca@wwc.edu).

The use of monoclonal antibodies in tumor identification has been rapidly increasing over the past several years. Monoclonal antibodies can be used to detect and characterize tumor specific and tumor associated antigens. We have generated two hybridoma cell lines (11H and 12A) that produce monoclonal antibodies reactive to a tumor associated antigen (TAA) on 9L gliosarcoma derived from Fischer 344 rats. We used these antibodies to identify and characterize the antigen present on 9L. Using periodic acid treatment it was found that the epitope of the antigen was a carbohydrate. We further determined whether the antigen was a glycolipid or a glycoprotein.

Teaching General Thinking/Scientific Literacy Skills Applicable Across A Wide Variety of Subjects and Contexts That Generalize Across Domains and Last Long into the Future, **DIANE F. HALPERN** (Professor and Chair of Psychology, Claremont McKenna College, 500 E. 9th Street, Claremont, CA 91711; E-mail: diane.halpern@claremontmckenna.edu).

The twin abilities of knowing how to learn and know-

ing how to think clearly about the rapidly proliferating information that we must select from are the most important intellectual skills for the 21st century. A general list of skills that would be applicable in almost any class and in many different situations outside of class would include: understanding how cause is determined, recognizing and criticizing assumptions, analyzing means-goals relationships, giving reasons to support a conclusion, assessing degrees of likelihood and uncertainty, incorporating isolated data into a wider framework, and using analogies to solve problems. These are general thinking skills/ scientific literacy skills that should be applicable across a wide variety of subjects and contexts. The real question is can we teach these skills so that they generalize across domains and last long into the future. This deceptively simple question rests on an operational definition of critical thinking, how we measure it, how we teach it, what students do to learn, and when we assess. Empirical research has shown that with appropriate instruction college students and other adults will transfer skills across academic domains and use them in different contexts over time, when they are taught for transfer and long-term retention. A short sampler of applications from cognitive psychology designed to improve thinking skills will be presented.

Evidences of Biogeochemical Factors Affecting Mercury Methylation in Sediments of the Venice Lagoon, Italy, **SEUNGHEE HAN¹, PATRIZIA PRETTO^{1,2}, ANNA OB-RAZTSOVA¹, JORIS GIESKES¹, and BRADLEY M. TEBO¹** (¹Scripps Institution of Oceanography, La Jolla, CA 92093, USA; ²University of Padova, Padova (VE), Italy).

One possible solution for managing sediments dredged from Venice Lagoon, Italy, is to relocate the sediments and construct submerged intertidal banks in other areas of the lagoon. However, the effects of such a plan on sediment biogeochemistry, particularly the cycling of mercury (one of the more important contaminants in the lagoon) are unknown. In this project, experimental banks were constructed using slightly contaminated sediments and sediment biogeochemistry was monitored with time. In order to identify the factors affecting the methylation of inorganic mercury, we measured mercury methylation and sulfate reduction rates, total and monomethyl mercury concentrations, and performed microbial community analysis in sediments collected from different sites of the Venice Lagoon before and after bank construction. While mercury methylation rate and sulfate reduction rate were generally higher in the surface layers (0–2.5 cm), the correlation between mercury methylation rates and sulfate reduction rates was not significant considering all depths and sites. This discrepancy may be due to two factors: the activity of sulfate-reducing bacteria and mercury bioavailability. The former factor is important in comparable geochemical conditions as evidenced by similar vertical profiles between mercury methylation rate and sulfate reduction rate in each sediment core. The latter factor considers that

HgS⁰ is a major bioavailable species of inorganic mercury. This is consistent with the results of this study showing that mercury methylation rate normalized to sulfate reduction rate decreases exponentially as a function of sulfide concentration in high sulfide sediments.

This work is a component of the "SIOSED" project, a part of a comprehensive effort to support the integrated management of Venice Lagoon sediments and ecosystems promoted by the Venice Water Authority through its Concessionary, Consorzio Venezia Nuova.

Urban Runoff and Sedimentation Study of the Los Peñasquitos Watershed, **MIKE HASTINGS** (Executive Director, Los Peñasquitos Lagoon Foundation, PO Box 940, Cardiff by the Sea, CA; E-mail: mikehastings101@yahoo.com).

Adjacent to the Torrey Pines State Reserve, Los Peñasquitos Lagoon (LPL) is a .62 square-mile coastal salt marsh that receives freshwater drainage from a 98 mile² watershed comprised of three major canyons (Carroll/Sorrento, Los Peñasquitos, and Carmel Canyons). Historically, LPL received seasonal flows of freshwater from the watershed from December through April. However, since 1996 there has been a permanent shift in this paradigm with freshwater input occurring both year round and at an accelerated rate. This change was directly linked to urban runoff from recent development, specifically in the western portion of the watershed and along lagoon boundaries. Impacts associated with this change include: loss of historic salt marsh terrestrial habitat, restriction of the lagoon's tidal prism, and increased erosion and down-stream sedimentation during storm events. The San Diego Basin Plan and 2002 Clean Water Act Section 303(d) identify sedimentation as a significant impact linked to urban encroachment and a leading cause in the rapid destruction of salt marsh habitat in LPL, making sediment reduction a management priority. In 2001 and 2002, the Los Peñasquitos Lagoon Foundation was awarded funding under the Costa Machado (Prop 13) Nonpoint Source Pollution Program to address the issue of sedimentation through two sediment abatement projects. These projects modeled the three sub-watersheds specifically for flow rates and sediment transport during normal conditions and storm events, provided a sediment control map for the watershed, generated 3 alternatives for sediment control in each sub-watershed, and resulted in the design and permitting of a custom-made sediment retention basin along Los Peñasquitos Creek.

The San Diego County Plant Atlas Project, **MARY ANN HAWKE and JON P. REBMAN** (Department of Botany, San Diego Natural History Museum, P.O. Box 121390, San Diego, CA 92112-1390; E-mail: mhawke@sdnhm.org).

When the San Diego County Plant Atlas project was started in 2002, the existing county collection comprised only a quarter of the total plant specimen collection in the museum's herbarium, and many of those collections had been made over 60 years ago. Further, the published flora for the county was over 15 years old, and provided limited

distributional information. This was surprising, considering that San Diego County is an internationally-recognized biodiversity hotspot with 26 endemic plant species and more floristic diversity than any other county in the continental United States.

To address this lack of floristic documentation, we began recruiting community volunteers and training them how to collect voucher plant specimens and field data (including point coordinates) from across the county, and submit them to the museum. The project has produced three main products, including the following: the public training program and website (www.sdplantatlas.org); the online database and data submission system; and the specimen collection. Over 17,000 specimens (including 130 new county records) have been added to the herbarium and the publicly searchable online database.

This effort has increased our knowledge of the native flora by 58 total taxa, including 40 species. The training program engages the public in regional natural history, and everyone derives educational, scientific, and public policy benefits.

Characterization and Reactivity of Transition Metal Complexes towards the Hydrolysis of Phosphodiester Bonds, **MARCEL HETU** (Department of Chemistry and Biochemistry, San Diego State University, CSL-211, 5500 Campanile Dr., San Diego, CA 92182; E-mail: marcel.hetu@cox.net).

Mononuclear and dinuclear complexes of labile metals have been synthesized to test their effects on hydrolytic reactions involving phosphoester bonds. The ligands were synthesized to be water-soluble and contain both N-donor atoms as well as sulfanate O-donor atoms. The ligands have been characterized by ¹H-NMR and ¹³C-NMR. The ligands were reacted with Cu (II), Ni (II), Zn (II), and Co (II) metals to yield their corresponding metal complexes. These complexes have been characterized by x-ray crystallography. The catalytic ability of these complexes were tested by reacting them with bis(p-nitrophenyl) phosphate at pH 8.4 at 50°C and monitoring the reaction progress on a UV/Vis spectrometer. The complexes were also reacted with litmus 29 plasmid DNA to test for phosphodiester cleavage of the DNA backbone by comparing the relative amounts of supercoiled, nicked, and linear DNA.

Death Along the Border, from an Anthropological Perspective, **MADELEINE J. HINKES** (Behavioral Science Department, San Diego Mesa College, San Diego, CA 92111; E-mail: mhinkes@sdccd.edu).

California shares a 150-mile border with Mexico. Traditionally, this border has seen a nonstop illegal migration flow. In the 1990s, the Border Patrol began a concerted effort to establish and maintain control of the border, beginning in urban San Diego. This heightened law enforcement presence, known as Operation Gatekeeper, changed the west-

ernmost segment of the border from the most permeable to the least permeable. This enforcement pushed migrants into more dangerous crossing areas in eastern San Diego and Imperial Counties, making their trip longer and more physically challenging as they made their way through treacherous mountains, deserts, and irrigation canals. Death rates soared, due mostly to exposure.

At this point, medicolegal issues supersede sociopolitical ones. The deaths need to be investigated, remains autopsied and identified, next of kin sought. Bodies decompose rapidly here. The traditional means of identification do not necessarily work with these remains, due to lack of accessible antemortem data. Cooperation between forensic scientists, investigative agencies, and nations is necessary to prevent the designation of *no identificado*.

Novel Approaches That Accelerate and Enhance Drug Discovery, **RICHARD A. HOUGHTEN** (Torrey Pines Institute for Molecular Studies, 3550 General Atomics Court, San Diego, CA 92121; E-mail: houghten@tpims.org).

The approaches and concepts that encompass combinatorial chemistry represent a paradigm shift in drug discovery and basic research. Viewed initially as a curiosity by the pharmaceutical industry, combinatorial chemistry approaches are now recognized as essential drug discovery tools that decrease the time taken for discovery and increase the throughput of chemical screening by as much as 1000-fold. Although the use of mixture-based synthetic combinatorial libraries was one of the first approaches presented, its inherent strengths are only recently being recognized. Numerous mixture-based libraries of peptides, peptidomimetics and heterocycles have been synthesized and deconvoluted using the positional scanning approach. Mixture-based library approaches for drug discovery and vaccine development will be discussed. The results presented demonstrate that combinatorial mixture synthesis and screening can play a vital role in the discovery of new leads for a variety of targets, ranging from antimicrobial and pain therapeutics to cancer vaccines.

References

Houghten, R.A.; Pinilla, C.; Appel, J.R.; Blondelle, S.E.; Dooley, C.T.; Eichler, J.; Nefzi, A.; Ostresh, J.M. *J. Med. Chem.* 1999, 42 (19), 3743-3778.
Nefzi, A., Ostresh, J.A., Yu, Y. and Houghten, R.A. *J. Org. Chem.* 2004, 69 (11), 3603-3609.

Time-reversed Causation or Extant Indefinite Reality? **JOOP M. HOUTKOOPER** (Centre for Psychobiology and Behavioral Medicine at the Justus-Liebig-University of Giessen, Otto-Behaghel-Strasse 10F, D-35394 Giessen, Germany; E-mail: joophoutkooper@gmail.com).

The possibility of time-reversed causation has been considered to explain the occurrence of anomalous phenomena in which the ostensible effects are preceded by their causes. A scrutiny of both experimental methodology and the experimental data is called for. A review of experimental data reveals the existence of such effects to be a serious possibility. The experimental methodology entails some conceptual

difficulties, these depending on the underlying assumptions about the effects. A major point is an ambiguity between anomalous acquisition of information and time-reversed causation in exerted influences.

A unifying theory has been proposed, based upon the fundamental randomness of QM. QM randomness may be regarded as a tenacious phenomenon, that apparently is only resolved by the human observer of the random variable in question. This has led to the "observational theory" of anomalous phenomena, which is based upon the assumption that the preference of a motivated observer is able to interact with the extant indefinite random variable that is being observed. This observational theory has led to a novel prediction, which has been corroborated in experiments. Moreover, different classes of anomalous phenomena can be explained by the same basic mechanism. This foregoes retroactive causation, but, instead, requires that macroscopic physical variables remain in a state of indefinite reality and thus remain influenceable by mental efforts until these are observed. More work is needed to discover the relevant psychological and neurophysiological variables involved in effective motivated observation. Besides these practicalities, the fundamentals still have some interesting loose ends.

Mitigating Selenium Ecotoxic Risk by Establishment of a Model Aquatic Ecosystem, **KRASSIMIRA HRISTOVA, JENNIFER BRADFORD, TERESA CASSEL, RADOMIR SCHMIDT, TERESA FAN, and RICHARD HIGASHI** (Department of Land, Air and Water Resources, University of California, Davis, CA, 95616; E-mail: krhristova@ucdavis.edu).

Irrigation practices through the vast agricultural lands of California result in water quality degradation due to the release of naturally occurring salts, selenium and other trace elements into the groundwater. The aim of this research is to establish a method for the reduction of selenium ecotoxic risk, posed by contaminated agricultural drainage water, in a model aquatic ecosystem that optimizes total selenium remediation through the combination of natural selenium volatilization and food chain disruption.

We established a model aquatic ecosystem containing agricultural drain water from Red Rock Ranch, CA inoculated with microphyte mixed cultures in shallow basins at the field. Microphyte communities were evaluated in response to combinations of nutrient additions of N, P, and Fe (basins 4, 5, 6), or chicken manure and alfalfa (basins 1, 2, and 3), in terms of species composition and growth response. Two months after the microphyte inoculation we inoculated the basins with brine shrimp (*Artemia franciscana*). Harvesting of these macroinvertebrates, which feed upon the volatilizing phytoplankton, minimizes food chain transfer and ecotoxic risk. The microalgal and total bacterial communities were profiled using specific 16S rDNA-PCR primers and Denaturing Gradient Gel Electrophoresis. Volatilized seleni-

um and total selenium in the water medium and algal tissue were measured. Changes in microbial community structures were correlated to environmental inputs as well as uptake and volatilization of selenium. The results from this study will provide valuable information for design strategies to optimize selenium remediation and reduce ecotoxic risk from exposure to contaminated drainage water.

Why Study (or Teach) Psychology? **KAREN HUFFMAN** (Psychology Department, Palomar College, 140 West Mission Road, San Marcos, CA 92069-1487; E-mail khuffman@palomar.edu).

Years ago, as part of his presidential address to the American Psychological Association, George A. Miller urged psychologists to “give psychology away.” Psychological science had accumulated a wealth of valuable research about the human condition, and Miller believed the public had a right to this information. Today’s students are more in need of Miller’s recommended applied, psychological science than ever before. Our political, economic, and academic worlds have all undergone enormous disruptions and challenges in the last few years. Our students need relevant material useful for critically evaluating these changes and clear applications of psychology to their personal, everyday lives.

Unfortunately, the need for increased critical thinking and applied psychology also comes at a time when professors face increasing pressures for “accountability and assessment.” How can we “give psychology away” and still cover all the necessary “basics?” My presentation/workshop will focus on improving critical thinking along with achievement test scores, while also offering tips for personal application. Specific classroom activities and exercises will be demonstrated, and detailed handouts will be provided. Attendees will be asked to reflect upon their own learning experiences and to share their insights.”

Heterogram Analysis As Cross-Cultural Analysis Method, **ALVIN HWANG** (Pace University, 132 E. Clay Ave., Roselle Park, NJ 07204, USA; E-mail: Alvin_netpost@isp.com).

The predominant practice in cross-cultural research is to compare groups in terms of statistical averages. However, we consider the fact that individual types are not subgroup variations, but exist across boundaries between groups, and are therefore transgroup occurrences. In other words, any individual type that is found in a cultural, social or gender group is found also in other cultural, social and gender groups (Maruyama 1980, 1995, 1999; Oyserman, Coon, Kimmelmeier 2002).

This paper uses a method similar to heterogram analysis (Maruyama 1995, 1999) to analyze data from Singapore, Hong Kong and North America on individualism/collectivism dimensions (Wagner 1995). Five individual types were found which cut across geographic, ethnic and gender bound-

aries. The first type exhibited high scores on all dimensions of collectivism. The second type was oriented toward individualism. The other three types embodied varying degrees between collectivism and individualism orientations.

As ANOVA test was applied to two sets of data: desire for face gain and fear of face loss (Hwang, Francesco and Kessler 2003) where “face” means respect, reputation or prestige, because the concern for face is believed to exist in all cultures (Earley 1997; Holtgraves and Wang 1992). The results supported the transgroup occurrences of individual types on face scales as related to individualism/collectivism dimensions.

Are Advanced Potentials Anomalous? **MICHAEL IBISON** (Institute for Advanced Studies, 4030 West Braker Lane, Austin, Texas 78759, USA; E-mail: ibison@earthtech.org).

Advanced electromagnetic potentials are indigenous to the Maxwell theory. Generally however they are deemed undesirable and are forcibly excluded from both the classical and 2nd quantized theories. At first we point out that in the state of affairs in QED at zero Kelvin, i.e., in the EM ZPF, advanced potentials are just as viable as retarded potentials. Correspondingly one may associate the time-reversibility of the 0K state with a time-symmetric combination of advanced and retarded potentials. Since this state of affairs is *mandated* by the direct action version of EM, we argue that theory should be preferred to the Maxwell theory on the grounds of not introducing unused degrees of freedom (namely the *difference* between the advanced and retarded potentials). But at elevated temperatures one then requires a plausible explanation for the broken symmetry that, commonly, is understood cannot be met by the Wheeler-Feynman mechanism because the necessary boundary condition cannot be satisfied in acceptable cosmologies. But here we argue that the boundary condition can be met without difficulty simply through cosmological expansion. From this we conclude that the cosmological and thermodynamic arrows of time can be equated, the direct action version of EM is redeemed, and that advanced potentials may in fact be ubiquitous.

Turbulence in Rotating Stratified Shear Flow, **FRANK JACOBITZ** (University of San Diego, 2998 Alcalá Park, San Diego, CA 92110; E-mail: Jacobitz@sandiego.edu).

The effect of rotation on the evolution of turbulence in a stably stratified shear flow is investigated using direct numerical simulations. The prototypical example of this flow is considered here with uniform vertical shear, constant system rotation about the vertical axis, and uniform vertical stable density stratification. In the absence of rotation, growth of the turbulent kinetic energy is observed for weakly stratified flows. As the stratification is increased, the growth of the turbulent kinetic energy weakens and decay is observed for strongly stratified flows. Counter-gradient fluxes are observed in the strongly stratified cases. For moderate stratifi-

cation, rotation leads to a stronger growth of the turbulent kinetic energy. For strong stratification, however, virtually no effect of rotation on the evolution of the turbulent kinetic energy was observed for the range of parameters studied here. The tendency for counter-gradient fluxes was observed to decrease with increasing rotation for strongly stratified flow.

Complexity Theory of Molecular Heat Engines and Tightened Versions of the Second Law, **DOMINIK JANZING** (Institut für Algorithmen und Kognitive Systeme, Fakultät für Informatik, Universität Karlsruhe, Am Fasanengarten 5, D-76 131 Karlsruhe, Germany; E-mail: janzing@ira.uka.de).

I consider hypothetical molecular heat engines that extract work from a hot and a cold quantum system by performing a unitary transformation on the joint system. When interpreting these unitaries as logical transformations, it turns out that thermodynamically optimal heat engines correspond to quite complex logical transformations and that the ability to extract work on the molecular level is closely connected to the ability to compute. This link gets even more obvious when the quantum systems consist of several two-level systems that are interpreted as bits. For few two-level systems, the maximal amount of extractable work is strictly less than the conventional formulation of the second law would allow. For many two-level systems, the maximal efficiency can only be reached when the heat engine implements a Boolean function that is a proper multi-bit operation of not too low logical depth. This shows that there is a trade-off relation between complexity and efficiency of molecular heat engines.

Paleontology of the Anza-Borrego Desert, an Uninterrupted Marine Late Miocene and Terrestrial Pliocene through Pleistocene Record from the Western Salton Trough, **GEORGE T. JEFFERSON** (Colorado Desert District Stout Research Center, Anza-Borrego Desert State Park, 200 Palm Canyon Drive, Borrego Springs, CA 92004; E-mail: gjefferson@parks.ca.gov).

The unique geologic setting of Anza-Borrego Desert State Park®, along the western margin of the Salton Trough rift, provides a 25 Ma history of continental crustal rifting, basin sedimentation, and detachment and strike-slip faulting. The later part of the fossil record of this region spans approximately 7 Ma, with no recognized breaks from late Miocene through the late Pleistocene time. This over 6 km-thick sequence contains several dated tephra and is temporally calibrated by paleomagnetic transects. Marine, fresh-water, and terrestrial assemblages include over 550 taxa ranging from pollen and trees, to brittle stars and colonial corals, to walrus and mammoths. Combined with long and complete sedimentary depositional sequences, these ecologically diverse fossil assemblages comprise an unparalleled North American paleontologic and paleoenvironmental resource.

The 249 taxa of marine organisms include carbonate

platform, outer and inner shelf, and near-shore corals, mollusks, echinoids, arthropods, sharks and bony fish, sea turtle and marine mammals. These paleofaunas predate the closing of the Isthmus of Panama, documenting tropical conditions in the proto Gulf of California between about 6 and 4.5 Ma. Thick deltaic deposits of the ancestral Colorado River yield a 4 to 3.5 Ma old paleoflora of coastal California and central Mexican affinities. Terrestrial assemblages spanning the Pliocene-Pleistocene Epoch and the Blancan-Irvingtonian NALMA boundaries in a 3.5 Ma-long conformable stratigraphic section include 214 taxa of fresh water plants, mollusks, arthropods, fish, amphibian, reptiles, birds and mammals. Recording intercontinental dispersals, early vertebrate assemblages, particularly lacertilians and rodents, reflect neotropical origins, and later assemblages exhibit holarctic affinities.

Building a Biotech Company Through Licensing, **WENDY JOHNSON** (ProQuest Investments, 12626 High Bluff Drive, Suite 325, San Diego, CA 92130; E-mail: wendyj@proquestvc.com).

In recent years a NRDO (no research development only) business model has emerged in the biotechnology community. Many companies have been started by in-licensing neglected drugs or drug candidates from large pharmaceutical companies, biotech companies or universities. This business model will be described along with specific examples from the San Diego area.

Development of Gene Drive Systems in Mosquitoes, **JENNIFER JUHN and A.A. JAMES** (University of California, Irvine, Irvine, CA).

We are currently investigating a disease control strategy in which a gene conferring a pathogen-refractory phenotype is introduced into mosquito populations. This population replacement approach requires a drive system that will quickly spread and fix antipathogen effector genes in target populations. Modified transposable elements containing the control sequences of developmentally regulated genes may provide the basis for a gene drive system that regulates gene mobilization in a sex- and stage-restrictive manner. Screening of a *Drosophila melanogaster* database for genes whose products localize exclusively in the future germ cells during early embryonic development resulted in the identification of several candidate genes. The regulatory sequences of these genes could be used to drive transposition. Mosquito orthologous genes of *oskar* were identified based on sequence homology and characterized further. The tissue- and sex-specific expression profiles and hybridizations in situ show that *oskar* orthologous transcripts in *Anopheles gambiae* and *Aedes aegypti* accumulate in developing oocytes of adult females and localize to posterior poles of early embryos. These characteristics potentiate the use of the regulatory sequences of mosquito *oskar* genes for the control of modified transposable elements.

High Temperature Conductivity and Reactivity of Carbon Nanotube Electronic Circuits, **ALEXANDER A. KANE and PHILIP G. COLLINS** (Department of Physics and Astronomy, 4129 Frederick Reines Hall, University of California at Irvine, Irvine, CA 92697-4575; E-Mail: collinsp@uci.edu).

At sufficiently high temperatures, carbon nanotubes (CNTs) react with their immediate chemical environments. Adsorbates desorb, carbides form with adjacent metals, and even the CNTs anneal at temperatures where Stone-Wales defects become mobile. Here we describe the characterization of individual CNTs using conductance as a sensitive probe of the chemical state. In contrast to bulk measurements such as thermogravimetric analysis (TGA) and spectroscopy, in which macroscopic amounts of material are required, the conductance method applies to samples with as few as 100,000 carbon atoms. By measuring the conductance of individual metallic CNTs from room temperature to 1200 K in ultra-high vacuum, we clearly identify different conductivity and reactivity regimes as well as the thermal population of high energy optical phonons. This electronic characterization agrees with and complements TGA of bulk, purified CNTs, indicating a new route for the materials characterization of nanostructures.

Aedes aegypti NHE8 Mediates Electroneutral Na⁺/H⁺ Exchange across Malpighian Tubule Apical Membrane and Catalyzes Na⁺ and K⁺ Transport in Reconstituted Vesicles, **WANYOIKE W. KANG'ETHE¹, KARLYGASH G. AIMANOVA², ASHOK K. PULLIKUTH³, and SARJEET S. GILL^{1,2}** (¹Graduate Program in Environmental Toxicology, ²Department of Cell Biology and Neuroscience, University of California, Riverside, California 92521, U.S.A.; ³Department of Pharmacology and Experimental Therapeutics, Louisiana State University Health Sciences Centre, New Orleans, Louisiana 70112).

Female mosquitoes such as *Aedes aegypti* require robust sodium and fluid transport systems to rapidly and efficiently remove sodium chloride whose concentration rises dramatically in the hemolymph after blood feeding. The identities of the proteins involved in this transport process are not precisely known, but electrophysiological assays generally indicate a role for Na⁺/H⁺ exchange activity putatively coupled to H⁺-ATPase in the mosquito's Malpighian tubules. We have identified a candidate exchanger and designated it *Ae. aegypti* NHE8 after its mammalian homologs. Using immunohistochemistry, we have determined that the exchanger is expressed in the apical membranes of Malpighian tubules and in the rectum. Further, when expressed in *S. cerevisiae* cells devoid of endogenous Na⁺/H⁺ exchange activity, it partially rescues the mutants allowing growth in limiting high salt media.

To determine the exchanger's kinetic properties, we reconstituted membranes from yeast cells expressing the pro-

tein into lipid vesicles and assayed for cation-dependent H⁺ exchange using the pH-sensitive fluorescent dye HPTS. Our preliminary results show that *Ae. aegypti* NHE8 is capable of mediating saturable electroneutral exchange of Na⁺ and K⁺ for H⁺. We propose that NHE8 may function by utilizing the proton gradient created by the H⁺-translocating V-ATPase across the plasma membrane, to extrude excess sodium and potassium into the tubule lumen during diuresis.

Quantum Mechanics and the Second Law of Thermodynamics: Can a Quantum Heat Engine Break the Law? **PETER D. KEEFE** (University of Detroit, 24405 Gratiot Avenue, Eastpointe, Michigan 48021 USA; Website: www.Keefengine.com; E-mail: PDK@Keefengine.com).

While the absolute status of the First Law of Thermodynamics is historically unchallenged, challenges to the absolute status of the Second Law of Thermodynamics are historic, extending back to the fabled "Demon" of Maxwell in 1871 to the present day, notably exemplified by the First International Conference on Quantum Limits to the Second Law held at the University of San Diego in July, 2002. The Carnot engine is universally acknowledged as the most efficient heat engine cycle operating between two temperature heat reservoirs, one hot, the other cold. Indeed, the Carnot heat engine cycle is theoretically 100% efficient if the low temperature heat reservoir is at absolute zero, and this is so independent of choice of working medium, whether classical (as for example a gas in the context of P-V space) or quantum mechanical (as for example superconductivity in the context of H-T space). This paper will investigate what boundary conditions, if any, can be placed on a quantum mechanical working medium, as well as its processing heat engine cycle, which could provide, at least in theory, supra-Carnot efficiency.

Sex and Emotional Memory, **LISA KILPATRICK** (Center for Neurovisceral Sciences and Women's Health, University of California, Los Angeles, 11301 Wilshire Blvd, Bldg 115, Los Angeles, CA, 90073; E-mail: lakilpatrick@mednet.ucla.edu).

Recent neuroimaging studies have demonstrated a sex-related hemispheric lateralization in the function of the amygdala, a region critical for the modulation of memory processes during emotional arousal. These studies consistently indicate a greater involvement of the left amygdala in memory for emotionally-arousing material in women and a greater involvement of the right amygdala in memory for the same material in men. This lateralization pattern (women left, men right) does not occur only in response to emotional stimulation; it is evident in the functional connectivity of the amygdala during resting conditions. These findings underscore the sexually dimorphic nature of the human amygdala. A review of the research on sex-related differences in amygdala structure and function will be discussed as well as potential links to sex-related differences in addiction and anxiety disorders such as major depression.

Personality Dimensions in Chimpanzees, **JAMES E. KING** (Department of Psychology, University of Arizona, Tucson, AZ 85721-0068; E-mail: kingj@u.arizona.edu).

Over the past ten years, we have been studying the personality structure of zoo-housed chimpanzees. Zoo employees rated individual chimpanzees on 43 adjectives that were descriptive of personality traits. The raters assigned each adjective a score from 1 to 7 depending on how accurately the adjective described the chimpanzee being rated. A factor analysis showed the presence of six factors. The interrater reliabilities of all factors were excellent and comparable if not higher than interrater reliabilities of human ratings for other humans. Five of those factors resembled the five factors that are usually assumed to underlie differences in human personality. These human-related factors included Extraversion, Agreeableness, Dependability, Emotionality and Openness. The Dependability dimension is usually designated as Conscientiousness when applied to humans. The adjectives defining the low pole of this factor reflected a combination of unpredictability and irascibility. Only the former is generally included within the domain of human conscientiousness. The sixth chimpanzee factor was named Dominance because it reflected overall confidence, independence, and social prowess. Interestingly, the components of chimpanzee Dominance are usually incorporated within the Extraversion factor in humans. These results indicate that the dimensions of personality can be compared across species. The inclusion of an aggressive component in chimpanzee the chimpanzee Dependability factor and the separate Dominance factor in chimpanzees suggests a basis for inferring changes in personality structure during primate evolution.

Use of Refutational Text and Lecture in Conceptual Change and Dispelling Misconceptions Across Disciplines, **PATRICIA KOWALSKI and ANNETTE TAYLOR** (Department of Psychology, University of San Diego, 5998 Alcalá Park, San Diego, CA 92110; E-mail: taylor@SanDiego.edu).

As specialists in behavioral science psychologists should be at the forefront of teaching about teaching and learning. However, when it comes to dispelling misconceptions and promoting conceptual change, psychologists have had to learn from physics and education professors techniques that best promote the unlearning of faulty conceptions brought into the classroom. In this session we will provide the opportunity for participants to learn to discriminate readings and lecture formats that are 'refutational' in nature, and we will provide evidence for the efficacy of such teaching methods.

Hydrogeological Studies for a Sustainable Management of the Guadalupe Aquifer, **THOMAS KRETZSCHMAR** (Department of Geology, CICESE, Ensenada, Baja California; E-mail: tkretzsc@cicese.mx).

Baja California counts with various valleys where the hydrogeologic conditions are of great importance for the com-

munities of the region. The Guadalupe Valley for example, located 30 km Northeast of Ensenada, has a wine industry, which presents an important factor for the of agriculture and tourism sectors of the State of Baja California. The irrigation of the crops is mainly carried out by groundwater from the local aquifer which consists of quaternary sediments filling this Post-Miocene depression. Alternative sources for the irrigation are the precipitation and the surface water runoffs of arroyos leaving the mountain ranges as well as the few existing rivers. Besides the intense use of the water by the wine industry, the municipal water supplier of Ensenada (CESPE) installed in 1985 wells to supply the city with drinking water. Up to now CESPE operates 10 wells with a total capacity of 320 L/s or 30% of extracted water the valley.

The knowledge of the aquifer is crucial to be able to maintain a sustainable management of the water in the Guadalupe Valley. The intense use is reflected by a degradation of the water quality and a decrease of the water table. Several areas show an even more severe deterioration in form of an increase in sulfates, sodium and chloride. The zones with little affectation in their chemical composition are located close to the recharge area along the Rio Guadalupe. Nevertheless it is necessary to verify these data to be able to establish a quantitative balance of the study area.

The Relationship between Classroom Practices on Homework and Student Performance in Mathematics Based on the Trend of International Mathematics and Science Study in 2003, **MING-CHIC LAN and MIN LI** (Area of Educational Psychology, College of Education, Box 353600, University of Washington, Seattle, WA 98195; E-mail: mclan@u.washington.edu).

Research has documented ample evidence on how homework affects their students' performance. However, most of research mainly focused on the relationship between one specific dimension of homework with student performance without taking diverse characteristics of homework into account. As a result, the research findings not only oversimplify the relationship between homework and student learning but also it is difficult for teachers to adopt in their daily classroom practices due to such an oversimplification.

The proposed study conceptualizes homework as a multi-dimension product to examine the combined effects on student performance. We believe that the findings are more helpful for teachers to make instructional decisions because it is closer to the real instructional situations.

Thus, the purpose of the study is to explore the integrated effects of multiple-dimension homework which includes (a) 'the frequency of homework assigned', (b) 'the time of homework assigned', (c) 'the content of homework provided', and (d) 'the strategies teachers use for homework' on student performance by using questionnaire data from the US samples collected by the Trend of International Mathematics and Science Study (TIMSS) in 2003. Hierarchical

linear modeling technique was performed to (a) broaden the scope of homework in understanding key relationship with student performance, (b) suggest teachers how to use homework more effectively in classroom practices on homework, and (c) identify critical dimensions of homework to effectively predict student performance.

Entropy, Language, and Interpretation, **HARVEY S. LEFF** (California State Polytechnic University, Pomona, CA 91768 USA; E-mail: hsleff@csupomona.edu).

Language can guide or mislead, and can promote or impede understanding. The language of entropy will be examined for consistency with its mathematics and physics, and for its efficacy as a guide to what entropy “means.” Do common descriptors such as disorder, missing information, and unavailability help or hinder understanding? Can the language of entropy be helpful in cases where entropy is not well defined? These questions will be addressed, arguing for a descriptor that entails energy in a fundamental way. One such descriptor is ‘energy spreading.’ Acceptance of this term could lead to entropy’s symbol S being viewed as shorthand for ‘spreading.’

Phosphate Ester Hydrolysis Promoted by Water-soluble Metal Complexes, **HONG-CHANG LIANG, MARCEL HETU, BINDIA SHETTY, and WEN-LUNG CHANG** (Department of Chemistry and Biochemistry, 5500 Campanile Drive, San Diego State University, San Diego, CA 92182-1030; E-mail: hcliang@sciences.sdsu.edu).

Pyridyl-amine ligands with water-soluble sulfonate, carboxylate, or hydroxyl pendent groups of varying tether lengths and numbers of N-atom donors have been designed and synthesized along with their corresponding mononuclear Zn(II), Cu(II), Co(II), and Ni(II) metallohydrolase model complexes. The effects of the length and the rigidity of the water-soluble pendent on the structures of the metal complexes will be discussed, along with studies on the reactivities of these model compounds towards promoting the hydrolysis of activated carboxy and phosphate esters and DNA. The structural-reactivity correlations in the reactivity of the metallohydrolase model complexes will also be presented along with correlations between the number of N-atom donors and reactivity. In addition to the mononucleating ligands, heterodinucleating ligands and complexes have also been prepared to model dinuclear metallohydrolases. These ligands and complexes will also be discussed.

An Approach to Pricing Municipal Water in Drought-Prone Cities of Southern California and Elsewhere, **HUGO A. LOÁICIGA** (Department of Geography, University of California at Santa Barbara, Santa Barbara, CA; E-mail: hugo@geog.ucsb.edu).

A method for pricing residential municipal water with increasing rate structures is developed and applied in this ar-

ticle. The method relies on the water-use functions for each block of a rate structure and on economic and water-supply data to produce a nonlinear programming problem whose objective function is the recovery of water-production costs. Maximum-water use, minimum-water use, cost-recovery, and price constraints were imposed on the objective function to complete the rate-design nonlinear programming problem, whose solution yields the block prices and water-meter charge of a water-rate structure. The water-pricing method is applied to a small municipality –on the order of 90000 residents- whose water-use functions were derived from data collected during the 1988-1991 California drought. The water-pricing method produces a rate structure that complies with specified constraints and recovers water-production costs, demonstrating that it is a useful tool for residential water pricing.

Hydrologic Analysis of the Flooding-drying Cycle of Vernal Pools and Implications for Restoration, **HUGO A. LOÁICIGA** (Department of Geography, University of California, Santa Barbara, California 93106-4060 USA; E-mail: hugo@geog.ucsb.edu).

Ponding over terrain with negligible overland drainage is analyzed with differential equations of water balance involving (i) water input (constant or variable rainfall or artificial flooding) to the surface, (ii) Green-and-Ampt infiltration, and (iii) evaporation after rainfall. The water-balance equations describe three phases. In the first, infiltration equals the rainfall rate and ponding does not occur. The second phase begins with the initiation of ponding and continues until the cessation of rainfall, at which time begins the third phase, during which ponding subsides until it vanishes. Analytical solutions of the water-balance equations describing ponding phenomena are derived in the case of constant rainfall and constant evaporation. These solutions can be applied in step-wise fashion to solve the water-balance equations in the case of variable rainfall, or, alternatively, numerical solutions may be employed when the rainfall and evaporation inputs are known in functional form. The methodology developed in this work is well suited for flooding analysis and restoration planning in rain-fed wetlands with negligible overland drainage, in which the hydrograph of ponding depth and the topography of the surrounding terrain determine the flooded area. It can also be used to quantify ponding caused by irrigation in flat terrain, such as in rice paddies. Computational examples illustrate the effects of soil properties and rainfall distribution or water input on the temporal evolution of ponding using the Green-and-Ampt infiltration model.

Differentiation Between Left and Right Hemisphere Forms of Intelligence, **MARLENE LOBAUGH, CRISTINA ISAACS, NICHOLE MCWHORTER, TERI MCHALE, and HENRY V. SOPER** (Psychology Department, Fielding Graduate University, 2112 Santa Barbara Street, Santa Bar-

bara, CA 93105, E-mail: Marnielobaugh@aol.com).

Psychologists have long debated the structure of intelligence, whether a *general factor*, or *g*, with *specific* but related abilities, or separate and orthogonal intelligences. Current intelligence tests consist of highly intercorrelated subtests, lending support to the general factor theory. However, such intercorrelations may be a result of assessing only one form of intelligence. Strong analytic, left hemisphere, abilities can result in excellent performance in school and on IQ tests. Gestaltic, right hemisphere, abilities, such as those used to see relationships and understand body language, would contribute less to academics. To look into this, performances on intellectual evaluations were compared to scores on the Street Completion Test, a gestalt closure test which is a good predictor of right hemisphere functioning (e.g., social adroitness, ability to see relationships between objects and concepts). We compared intelligence and Street scores from 106 records from our clinic. The resultant correlation, $r = .008$, clearly indicates that there is effectively no shared variance between the two sets of scores ($R^2 < .0001$). Full Scale Score, as an estimate of *g*, is orthogonal to gestaltic closure ability. The Street score shared very little variance with the Verbal IQ and Performance IQ Scores ($r = -.021$ and $.095$ respectively). None of the Verbal subtests correlated significantly with the Street score, and only three of the Performance subtests did – Picture Arrangement, Block Design, and Object Assembly account for 8%, 9%, and 4% of the variance respectively. The results are discussed in terms of a bilateral theory of intelligence.

Why Glyoxal and Methyl Glyoxal Won't Evaporate: Cloud Processing and Triggered Polymer Formation, **KIRSTEN W. LOEFFLER, CHARLES A. KOEHLER, NICHOLE M. PAUL, and DAVID O. DE HAAN** (Department of Chemistry and Biochemistry, University of San Diego, 5998 Alcalá Park, San Diego CA 92110; E-mail: ddehaan@sandiego.edu).

Glyoxal and methyl glyoxal are common secondary atmospheric pollutants, formed from aromatic (and to a smaller extent, terpene) precursors. Both compounds are extremely water-soluble due to dihydrate formation, and partition into cloud water. In this work, FTIR-ATR and mass measurements indicate that both compounds remain solely in the condensed phase due to oligomer formation when aqueous solution droplets are evaporated. FTIR spectral analyses suggest that oligomer formation is triggered by conversion from dihydrate to monohydrate forms, which are still non-volatile but contain reactive carbonyl groups. Methyl glyoxal hemiacetal formation is observed by changes in the C-O / C=O stretch peak area ratio. The formation of glyoxal oligomers with an average length of 2.8 ± 0.4 subunits is detected by a dramatic shift of the C-O stretching peak towards low frequencies. Glyoxal oligomer peaks at 1070 cm^{-1} , 950 cm^{-1} , and 980 cm^{-1} are assigned to free C-OH stretch, dioxolane-

linked C-OC asymmetric stretch, and non-dioxolane-linked C-OC stretches, respectively. For glyoxal, dioxolane-linked oligomers are the main product, as in previous studies. Acids have little effect on glyoxal oligomer formation; however, base interrupts oligomer formation by catalyzing glyoxal hydration and disproportionation to glycolic acid. Since glyoxal and methyl glyoxal are commonly found in cloudwater and will not evaporate when cloud droplets evaporate, this process is a source of polymerized organic aerosol material via cloud processing.

The Phylogenetics of Panamanian Aechmea (Bromeliaceae): A Recent Adaptive Radiation? **KERI MAHER¹, ANTHONY METCALF¹, JORGE ARANDA², KLAUS WINTER², and JOHN B. SKILLMAN¹** (¹Department of Biology, California State University, 5500 University Parkway, San Bernardino, California, 92407, USA; ²Biology, Smithsonian Tropical Research Institute, Unit 0948, APO AA 34002, Panama City, Panama, 0843-03092, Panama; E-mail: maherk@csusb.edu).

Aechmea, with 220 described members, is a highly diverse genus in the neotropical family Bromeliaceae with respect to floral morphology, photosynthetic pathway (C_3 and CAM), and growth-form (terrestrial and epiphytic); yet, its phylogeny is poorly resolved. We are investigating the evolutionary relationships, with the intent of elucidating the origins of this diversity, among the 18 Panamanian species of *Aechmea*. Preliminary work using cpDNA sequence data (*rps16* intron, *trnL-F* intron and spacer region, and *matK*) revealed a surprisingly low level of genetic variation across all 18 Panamanian *Aechmea* taxa. One possible explanation for this low amount of DNA sequence variation is that there has been a recent adaptive radiation of *Aechmea* into Panama from South America. The Panamanian isthmus (Which formed 3 MYA) connects Central and South America, and provides an area for range expansion for many species, including *Aechmea*, into new habitats. Thus, it is possible that the geological history of Panama plays a role in the observed lack of genetic variation seen in our DNA sequence data. To test this hypothesis, the level of DNA sequence variation for the same loci in South American species (with a focus on Brazil, the putative center of origin for the Bromeliaceae) will be determined and compared to the Panamanian set.

Natural Selection, Taxonomy and Hierarchy: Casta Painting in 18th Century New Spain, **BARBARA YABLON MAIDA** (Department of Geography, University of California Los Angeles, Los Angeles, CA 90095-1524; E-mail: bymaida@ucla.edu).

The Enlightenment, in overturning natural philosophy's method of qualitative description, implemented systems of classification, most recognizable in Linnaean binomial nomenclature. Since this time, the natural and physical sciences have used various methods for naming and describing subdivisions of a whole; galaxies, organelles, subatomic particles are specialized points of view denoting ever smaller, detailed

landscapes suggesting nested systems, but not necessarily imparting hierarchy except through scale. *Casta* was the term used in Mexico to refer to different mixed races in society, and to indicate socioeconomic class. During the eighteenth century, casta paintings portrayed a man and woman of different races, and their children; a painted inscription identified the race of each individual, not unlike the labeling of botanical drawings. Each series used a specific taxonomic progression; as family groups become more racially mixed, their social status diminishes. Here was genre painting, documenting class-based socio-economic categories, rooted in biological classification, set forth by a religious institution, and sold to patrons across the Atlantic Ocean. This reinforced an image of the New World as exotic, degraded, heathen, paradisiacal, or some combination of these. Though taxonomic wealth defines modern, public museum culture, the gradient of eighteenth century reaction to exhibitions moved between scholarly conversation, and what could only be called gawking. Somewhere along this continuum, one found the patrons and owners of casta paintings. More than a simple visual account of the New World, here was the nexus of science and empire-building, motivated as much by national pride as by the public good.

HIV-Related Stigma and Prospects for Destigmatization, **CARL A. MAIDA** and **IAN D. COULTER** (University of California, Los Angeles, Center for the Health Sciences, Los Angeles, CA 90095-1668; E-mail: cmaida@ucla.edu).

New drug therapy and aggressive management have changed the nature of the HIV epidemic from one of acute illness to one of chronic illness. A fundamental change would occur at the cognitive level, with HIV being perceived differently and less negatively than it was at the beginning of the epidemic. It is also fairly clear that: the stereotyping HIV as a "gay disease" has changed, the devaluing of the HIV patient has improved and the more excessive forms of discrimination has stopped. The HIV epidemic has led to a renewed interest in stigmatization among social scientists and a reconceptualization of stigma to highlight the importance of power. While the professions have the power to control the stigma, the emergence of self-help and mutual aid groups, such as those founded by the gay activists involved in the AIDS epidemic, have shown that patients are not simply passive victims in the process of stigmatization. This new approach to stigma raises the questions: Does destigmatization occur? Why would those in power let it occur? What would constitute evidence of such a process? This paper examines the change from seeing HIV as an epidemic and a fatal disease to seeing it as a chronic illness as a possible example of destigmatization in action and both the problems and the promise of the process.

Genomics of Anopheles gambiae, **OSVALDO MARINOTTI** (Department of Molecular Biology and Biochemistry,

University of California, Irvine, Irvine, CA).

Insect vectors of diseases have been the objective of extensive investigation with the main purpose of finding novel and efficient ways to disrupt or diminish pathogen transmission. The concluded venture to sequence the genome of the human malaria vector, *Anopheles gambiae* represents a major advance in this direction. It is expected to present opportunities to improve vector control by revealing new gene targets for insecticides and insect repellents, and to advance novel strategies to control pathogen transmission. However, a key question to be answered by vector biologists is how to explore this sequence information in pursuit of these goals. The tools of functional genomics represent a way to obtain answers to this question. Determination of spatial and temporal expression patterns and the linking of genes to their biological functions are basic and fundamental steps to progress toward using sequence data for controlling disease transmission. In addition, with their genomes sequenced, mosquitoes can now serve as powerful tools for basic research, comparative, evolutionary and developmental biological studies that should lead to the understanding of the processes that shape insect genomes and their phenotypic expressions. We have looked at global changes in gene expression in adult, female *An. gambiae* before and after a blood meal, and at differences between males and females and young and old mosquitoes. A database containing gene expression profiles of approximately 14,000 genes was created and is publicly available (<http://www.angagepuci.bio.uci.edu>).

Voting on Issues Involving Three or More Alternatives, **DAVID U. MARTIN** (independent scholar, 13415 Sawtooth Road, San Diego, CA 92129; E-mail: martins@martins.cts.com).

Various voting procedures have been proposed for elections involving more than two candidates or alternatives. Examples include runoff, Borda voting, Condorcet voting, approval voting, cumulative voting, and variations on these themes. Normalized grading, another approach, is described in this study. Pros and cons of the various approaches are discussed, and a case is made for the merits of normalized grading with an instant runoff option.

Turning the Mainstream Current, **MAGOROH MARUYAMA** (Interactive Heterogenetics, 3833 Nobel Drive, Suite 3333, San Diego, California 92122, USA; E-mail: kuniko_maruyama@sbcglobal.net).

Today we are celebrating the most important turning point in the entire history of biological and social sciences. Until now, it was considered that in order to be scientific, one has to compute the statistical average of each group, and compare experimental, cultural, social or psychological groups in terms of the averages. Behind this practice were assumptions such as: (1) Differences between individuals were subgroup variations; (2) These differences were undesirable

bothersome abnormalities, unimportant random fluctuations, or noises; (3) They were attributable to imperfect test conditions or measurement errors.

In contrast, we consider that the heterogeneity among individuals and the interaction among heterogeneous elements are desirable, necessary and increasing in biological, social and cultural evolution. Furthermore, accumulated evidences show that individual types cut across boundaries between cultures, genders and species, and are therefore transcultural, pangeneric and transeidotic. In other words, each cultural, social or gender group, or primate species and primate social units, has heterogeneity of individual cognitive/cognitive types as well as personality types, even when the group is “ethnically pure.” Furthermore, any individual type that is found in a cultural, social or gender group is found also in all other cultural, social and gender groups. Beneath the culturally ritualized, socially conditioned standardized stereotypical behavior, heterogeneity of individual types exists in camouflaged or disguised forms. To ignore this fact entails psychological stress on individuals, and waste of human resources in organizations.

Physical Oceanographic Measurements in Venice Lagoon and Their Influence on Turbidity, **F.G. MARVAN, W. BOYD and M. HANY. S. ELWANY** (Scripps Institution of Oceanography, La Jolla, CA 92037).

Field work was carried out at three sites in Venice Lagoon during 2005. The measurements were carried out at three fixed stations in order to collect a continuous time series of current, wind, wave, turbidity, salinity, and temperature and water elevation data.

It is known that waves and tidal fluctuation are the main mechanisms of bed erosion in Venice Lagoon, and the magnitude and influence of both variables depend on the bottom configuration (i.e. channels, shoals and marsh areas.) The intent of this paper is to present the data and the analyses carried out on wind, waves and tides and their influences on turbidity.

The results presented in this paper are preliminary, and future research is in progress to better understand the relationship between turbidity and wind, waves, and other parameters.

This work is a component of the “SIOSED” project, a part of a comprehensive effort to support the integrated management of Venice Lagoon sediments and ecosystems promoted by the Venice Water Authority through its Concessionary, Consorzio Venezia Nuova.

Biomarkers of Toxicant Exposure: Roles of Metallothioneins in Metal Detoxification and Homeostasis, **A.Z. MASON** (Department of Biological Sciences and Institute for Integrated Research in Materials, Environments and Society, California State University, Long Beach, CA 90840; E-mail: zedmason@csulb.edu).

A variety of different biomarkers have been advocated as measures of toxicant susceptibility, exposure and effect in

aquatic systems. These biomarkers include suites of molecular, biochemical, enzymatic, physiological, histopathological and morphological responses that are elicited by organisms in a quantitative or qualitative way by exposure to contaminant stressors. One such biomarker proposed for metals is the protein metallothionein (MT). The transcriptional induction of metallothionein (MT) by elevated levels of metals such as Cd, Cu and Zn in aquatic organisms has been used to support the concept that this protein is an excellent candidate biomarker for chronic metal contaminant exposure. However, more recent evidence indicates that this protein family may function primarily in metal homeostasis and the redox-mediated distribution of Zn in animal cells, implying that protein expression may be uncoupled from stressor exposure. The current work describes experiments that have been used to directly probe the functionality of metallothionein in both metal detoxification and homeostasis and outlines the potential hazards of using this and other biomarkers for ecotoxicological risk assessments without consideration of their physiological roles *in vivo*.

Humanistic Science; Scientific Humanism: The Paradox, **FRED MASSARIK** (University of California, Los Angeles, Anderson School of Management, Los Angeles, CA 90095-1481; E-mail: fred.massarik@anderson.ucla.edu).

The ostensible dichotomy between the humanities and the sciences is reified by the following streams: (a) thoughtways in historical perspective, particularly as expressed by “learned elites” ensconced in institutions – notably church and other organized theologic entities, universities, family patronages – and more recently, funding agencies; (b) the conceptual and practical “organization of knowledge,” as demonstrated by the formal structure of academic schools and departments, and derivative modes of publication: journals, books – physical and electronic mode; and c) the part-desirable, part-specious specialization of sub-fields, both in the sciences and in the humanities, reflecting an infinite number of “knowledge points,” in complex, often-tenuous interrelation...now and (with apologies to Poe)... evermore. While considering both positives and negatives emerging from the above, we shall trace each of these streams in historic and philosophic perspective, providing case illustrations. We then suggest possible antidotes to mitigate what we believe to be malaise inherent in these streams of dichotomy, particularly in their virulent manifestations. Citing Mannheim, Gouldner, Parsons and Lewin, we will propose several pedagogic and institutional approaches to address issues noted.

Prediction and Experimental Verification of Two New Ferroelectrics, **J. E. MATTHEWS, M. ANDRUS, P. WU, P. PHOTINOS AND S. C. ABRAHAMS** (Physics Department, Southern Oregon University, Ashland, OR 97520).

We predicted in 2003 that $K_2HCr_2AsO_{10}$ is a new ferroelectric material,¹ based on the likelihood that the potential

barrier at the Curie temperature T_C between the structure in phase II and that of a hypothetical higher-temperature paraelectric phase I is surmountable since all polar displacements Δz at T_C from their equivalent positions in the phase I supergroup have $\Delta z \leq u_{\text{eq}}$ (the averaged thermal vibration amplitude for that atom) except for two atoms for which $\Delta z \approx 2 u_{\text{eq}}$. We confirmed all atomic positions and have shown the material contains one independent AsO_4 tetrahedron sharing different corners with two independent CrO_4 tetrahedra in each asymmetric unit of the elementary cell to give $\text{Cr}_2\text{AsO}_{10}^{3+}$ ions linked together by H bonds. The latter form infinite helices of radius ~ 0.60 Å about the 3_1 axis.²

We have now measured the capacitance of $\text{K}_2\text{HCr}_2\text{AsO}_{10}$ and find it unusually high, on the order of μF . $\text{K}_2\text{HCr}_2\text{AsO}_{10}$ clearly exhibits ferroelectric hysteresis, with a sharp rise in polarization as the electric field strength increases that approximates the rectangular-shaped hysteresis desired in device use. The capacitance of isomorphous $\text{K}_2\text{HCr}_2\text{PO}_{10}$, also confirmed as a new ferroelectric, is even higher than that of $\text{K}_2\text{HCr}_2\text{AsO}_{10}$.

References

1. *Acta Cryst.* (2003). B59, 541-556.
2. *Acta Cryst.* (2004). C60, i113-i116.

Tree Rings and the Calibration of the Radiocarbon Curve, DONALD J. MCGRAW (824 Southshore Drive, Chula Vista, CA 91913; E-mail: granttree@yahoo.com).

In 1952, Willard F. Libby published his first book (*Radiocarbon Dating*) on the subject of his new technique and then a second edition in 1955. In between those dates Edmund Schulman of the Laboratory of Tree-Ring Research of the University of Arizona, Tucson, had found the first hints of the great age of the Bristlecone Pines of the White Mountains of California. However, they were far from being of value in radiocarbon, or C-14, dating work even at the time of Libby's second edition. No other single living thing could provide such long year-by-year chronologies within one individual tree, nor were there any comparable long chronologies in the Coast Redwood that Libby had chosen as his first species to compare to the radiocarbon dating curve he had developed. Of course, there was the Giant Sequoia—a tree of known great age, but it had not yet been used by Libby or others. Bristlecone Pines would only later become obvious candidates for use in yet more refinement, calibration, of the curve and would eventually be so used. In the first half of the 1950s, some 350 dates had been published by Libby at Chicago and some eight other laboratories by then working on the subject. It would seem that the matter was solved, even before Bristlecones were employed, as to both the half-life of carbon-14 and the nature of the radiocarbon curve by the later 1950s or early 1960s, but that was very far from the case. Schulman died (1958) before he could see the greatest use to which 'his' trees were to be put in their first application within science, but Charles Wesley Ferguson, Jr., his most senior protégé, would carry on Schulman's work

and apply the immensely long Bristlecone chronology to the calibration of the radiocarbon dating problem, and in the process quite literally change the history of the world! This talk is taken from Dr. McGraw's latest book: *Edmund Schulman and the 'Living Ruins': Bristlecone Pines, Tree Rings, and Radiocarbon Dating*. (Publication information, and possibly copies, of the book will be ready for the Meeting.)

Mineral and Energy Resources of the Salton Trough, MICHAEL A. MCKIBBEN (Department of Earth Sciences, University of California, Riverside, CA 92521; E-mail: michael.mckibben@ucr.edu).

The Salton Trough is an active continental rift underlying the Imperial and Mexicali Valleys. Post-Miocene deposition of the delta of the Colorado River into this hot, active rift has generated a unique saline lake environment in the northern Trough, hydrologically isolated from the marine waters of the Gulf of California. Magmatic and geothermal heating of the deltaic-lacustrine sediments and their contained fluids has generated a variety of young hydrothermal systems and epithermal mineral deposits, overprinting and remobilizing an older generation of gold mineralization related to Mesozoic arc magmatism. The modern geothermal fluids in the rift range from dilute to extremely saline, and actively deposit gold and base metals both within (epigenetic) and on (syngenetic) the rift sediments. Examples of these diverse fluids and their mineral deposits will be described within the tectonic and hydrologic framework of the rift. Recent efforts to extract both energy and zinc from the geothermal fluids will also be discussed.

Antiquity's Fingerprints in an Ice Core: A Cosmic Encounter, A Cat's Eye, and Us Modern Humans, ADEN and MARJORIE MEINEL¹ with DAVID DRACH-MEINEL² and BARBARA MEINEL² (retired, University of Arizona, Tucson, AZ and Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA; ²The Meinel Group, Las Vegas, NV and Mexico City MX; E-mail: ameinel@earthlink.net).

The goal of the Greenland Ice Core Project, GRIP, was to determine the course of temperature and snowfall during the Ice Ages. The ice core also disclosed the record of cosmogenic beryllium, a proxy for the flux of cosmic rays — and perhaps also our roots.

Our analysis of the archival records of measurements from GRIP has disclosed evidence of the appearance 100,000 years ago of a bright point-source of cosmic rays. Following each piece of scientific evidence led us to discover that this source is a nearby active celestial object, known as the "Cat's Eye." By extremely rare chance a narrow jet of cosmic rays from the Cat's Eye is aimed at us. Curious signatures in the cosmic rays show that the central star, once thought to be a single star of peculiar class, is a close binary with one member being a rapidly-spinning black hole fed by matter torn off

an aging giant companion.

Cosmic rays are thought to be mutagenic, which could pose a hazard for manned voyages to the planets. Could the surges of cosmic rays from the Cat's Eye that irradiated the Earth for 100,000 years have left a fingerprint on life? Three surges of cosmic rays do coincide with the changes that distinguish our genetic makeup as being different from that of our Pleistocene ancestors. Was this purely a coincidence? Or were cosmic rays the *modus operandi* that shaped us modern humans, and that started us on our way to exploring new frontiers as the ice age waned?

We will present the story of these pieces of the puzzle from antiquity that were wrested from Greenland's icy plateau to the dating of DNA and bones in archeological sites in Eurasia.

Molecular Bionanotechnology Experiment in the Classroom, **MEL I. MENDELSON** (Mechanical Engineering Department, Loyola Marymount University, 1 LMU Drive, Los Angeles, CA 90045; E-mail: mmendels@lmu.edu).

A new course has been organized and taught at LMU – Nanotechnology for Non-Majors. The course is part of the core curriculum at LMU for non-science/engineering majors. The students took the course to satisfy their science requirement for obtaining a bachelor's degree. The goal of the course was to explain the language of nanotechnology, relate the macroscopic-microscopic-nanoscale worlds, and to explore the social and ethical issues. In addition, the course emphasized the biological applications of nanotechnology.

Throughout the course, the students had difficulty visualizing the size of a nanometer. In order to illustrate the concept, a finger nail growth experiment was conceived and conducted in the classroom over a 5 week period. The experiment provided a practical, hands-on method on the way scientists conduct experiments. A growth rate hypothesis was proposed (~1 nm/s). Various kinetic expressions were developed that could explain the rate of nail growth prior to the experiment. The experiment was conducted, and the data were plotted on a graph and analyzed. The data were interpreted in terms of keratin deposition and cell formation beneath the cuticle. The growth of nails was also observed under a scanning electron microscope.

The purpose of this paper is to discuss the rate of nail growth and determine the overall order of the reaction. The macroscopic measurements will be correlated with a nanoscopic mechanism for forming amino acid molecules in the α -keratin structure.

Microsite Effects on an Alpine Ecotype of the C4 Grass Muhlenbergia richardsonis, in the White Mountains of Eastern California, **ARCHIE MEYER¹, ROWAN SAGE² and JOHN B. SKILLMAN¹** (¹Department of Biology, California State University, 5500 University Parkway, San Bernardino, California, 92407, USA; ²Department of Botany University

of Toronto, 25 Willcocks St., Toronto, Ontario, M5S 3B2, Canada; E-mail: ameyer@csusb.edu).

It is generally accepted that C4 plants do well in warm but not cold climates. The presence of *Muhlenbergia richardsonis*, a presumably cold intolerant C4 grass, growing above 12,400' in California's White Mountains is surprising. Greenhouse studies demonstrate that alpine populations (12,400') are genetically distinct from sub-alpine populations (10,000'), suggesting ecotypic differentiation in this high-elevation C4 grass. We designed a field growth experiment to examine microsite effects on ecological performance of the alpine ecotype. Greenhouse cultivated *M. richardsonis* alpine clones were planted in 2004 on north or south slopes, in the presence or absence of rock sheltering at each of two elevations (10,000' or 12,400') in the White Mountains. Air temperature, soil moisture, plant growth, and survivorship were assessed for each of these eight microsite treatments in 2005. Preliminary analyses indicate that these microsite treatments affected both air temperature and soil moisture. At each elevation, south plots tended to be warmer than north plots. Plots with rocks tended to be warmer than those without rocks. Across all microsite treatments, warmer plots tended to have drier soils than cooler plots. Indicators of ecological performance varied among the eight microsite treatments in 2005. In particular, a strong positive association of soil moisture with both plant survivorship and growth indicates much of the variation in ecological performance can be explained by microclimatic variation. This finding is consistent with the hypothesis that the *M. richardsonis* alpine ecotype is specialized to the cool, moist microsite conditions common to upper elevations of California's White Mountains.

Triple Border Fence Initiative: United States Border Security or Violation of the Public Trust for Wetlands? **SUZANNE MICHEL** (Department of Marine Science and Environmental Studies, University of San Diego, San Diego, CA; E-mail: surfingsuzanne@cox.net).

The Tijuana River National Estuarine Research Reserve (TRNERR), a National Wildlife Refuge, lies on the border with Mexico facing the city of Tijuana -- it is one of the few unfragmented estuaries and coastal lagoons in Southern California. The Reserve contains several sensitive habitats such as sand dunes and beaches, vernal pools, tidal channels, mudflats and coastal sage scrub. The site is critical habitat for nationally endangered species and subspecies such as the San Diego Fairy Shrimp, the Light-footed Clapper Rail, and the Salt Marsh Bird's Beak; as well as nursery grounds for commercially important fish like the Diamond turbot and the California halibut. In Mexico, upstream in the watershed, habitat destruction, illegal grading, construction of concrete channels in stream beds; along with U.S. Border Patrol activities at the border; have altered the stream morphology, and ecological functions in the Tijuana River watershed that

drains to the TRNERR. Impacts to the TRNERR associated with upstream hydrological modifications include deposition of trash, sediment and water pollutants, resulting in the loss and degradation of wetland habitat.

On Earth Day 2005, the United Nations designated this estuary as a RAMSAR wetland of international importance. That same year, the U.S. Department of Homeland Security approved construction of the Triple Border Fence directly upstream of the TRNERR. This upstream 3.5-mile region along the U.S.-Mexico Border demonstrates steep canyons and gullies. If constructed as delineated in the Environmental Impact Statement, the Triple Border Fence could eradicate hillsides, cap mesa tops, plug canyons and could eradicate and/or degrade sensitive wetland habitat with sediment, trash and water pollution deposition. Using a watershed-species framework from sustainability science, the presentation will first delineate the ecological services wetlands provide for the public, and spatially explicit threats to the TRNERR by the Triple Border Fence. Second, the environmental law/policy context associated with the Triple Border Fence Environmental Impact Statement (EIS) process, and its proposed interventions to protect the TRNERR will be discussed. Third, the presentation will pose significant questions and recommendations for applicability of public trust doctrine to protect the biological and water resources of the Tijuana River National Estuarine Research Reserve.

Why the Journal Impact Factor Doesn't Work for Physics, **CASEY W. MILLER** (Department of Physics, University of California, San Diego, 9500 Gilman Drive, La Jolla, CA 92093, USA; E-mail: cmiller@physics.ucsd.edu).

In today's scientific community, the pragmatic motto "publish or perish" has mutated to "publish in a high Impact Factor journal or perish." We show that the journal Impact Factor is not correlated with indices that are accepted measures of research quality and reflections of peer review. Our analysis focuses on physics, but our results are undoubtedly relevant for all disciplines. The ranking gap between multidisciplinary journals and physics-only journals significantly closes when using the indices h and h' instead of the Impact Factor. The rankings are even inverted when only the physics articles of multidisciplinary journals are considered. This work implies that the Impact Factor is not a valid measure of research quality. We therefore call for the end of using authorship in high Impact Factor journals as a filter for job applicants, advancement to tenure, awarding of grants, or otherwise evaluating the success of individual researchers.

The Anthropology of Human Remains in Ritual Context, **ELIZABETH MILLER** (Department of Anthropology, California State University Los Angeles, Los Angeles, CA 90032).

Three ritual cases with human remains were recovered by the Los Angeles County Coroner. In the first two cases

ritual items and human remains were recovered from outdoor contexts. In both of these cases the human remains were of medical/educational origin, available from supply houses and online sources (including e-Bay, the internet auction site). The third case involved the recovery of similar items and a modern cranium of forensic value.

The cases were originally felt to represent Santeria rituals. Human bone is used in some Santeria rituals, although human sacrifice is not commonly practiced and even the use of human remains is extremely rare.

Anthropological analysis of the cases, particularly case three, indicated the rituals were more likely associated with an alternate occult religion: Palo. There are several forms of Palo, some benign and others vicious and depraved. Palo relies on the use of human remains for much of its power, and grave robbing is often used to obtain ritual pieces. Certain forms of Palo are feared by followers of other religions, including Santeria. Based on the ritual items and the modern human remains, a more likely origin for the cases analyzed in Los Angeles County is a form of Palo – this anthropological finding will dramatically impact the investigative direction of law enforcement in solving these crimes.

The Use of Ammonia in Geothermal Conversion: Power Cycle Designs for Low-Temperature Reservoirs, **MARK MIROLLI** (Recurrent Engineering, 393 Vintage Park Dr., #210, Foster City, CA 94404; E-mail: mark@recurrentengineering.com).

Many of the earth's geothermal reservoirs are relatively cool (200° to 400°F) and therefore far from ideal for use with traditional thermal conversion technologies. This paper introduces a conversion process capable of utilizing such lower-temperature resources for the efficient generation of electrical power.

The key to the process is an ammonia-and-water mixture used as the working fluid in a binary cycle. Compared to pure water, the mixture vaporizes at much lower temperatures. However, while the advantages of such a mixture in the vaporization stage of the cycle are readily apparent, energy engineers have long wrestled with the challenge of developing an efficient and practical method of condensing the vaporized mixture back into a fluid for reuse. A solution to that problem has emerged in the form of a separating/demisting apparatus capable of lowering the ammonia content of the mixture as it enters the condensing stage. The relatively high water content which results from separation allows the mixture to condense at slightly above atmospheric pressure. After condensation has been accomplished, the ammonia component can then be increased, preparing the fluid for re-introduction into the heat acquisition stage. By thus varying the mixture throughout the cycle, these new systems promise to maximize energy efficiency at every stage.

This paper will analyze the scientific principles behind this power cycle, the engineering principles involved in the

latest system designs, the lessons learned from its recent deployment in a variety of renewable energy projects, and the significance of this breakthrough for the global energy crisis.

Constraints Imposed on Retrocausation by Entropy and Information Considerations, **GARRET MODDEL** (Department of Electrical and Computer Engineering, CUB 425, University of Colorado, Boulder, CO 80309-0425; Email: moddel@colorado.edu).

Based on the criterion that retrocausal influence on a system cannot produce an inconsistency with what the retrocausal agent knows about the system's history, I show that retrocausal influence requires a concomitant increase in entropy.

A previous paper* dealt with the application of the second law of thermodynamics to psi phenomena. I showed that the second law would be violated by time-reversed psi processes in which an agent influences a system in such a way that its entropy is decreased. This idea was generalized to conclude that all psi processes cannot produce a decrease in entropy.

Here I extend that concept by considering an intervention paradox and the constraints it places on retrocausation. An agent cannot change the past to differ from what s/he remembers. This criterion places limits on the fidelity of information the agent may have about a past event and on the precision with which s/he may influence it (and is consistent with observational theory). Because these limits always impose some randomness on a retrocausal process, there is always an increase in entropy.

Thus we may relate the feasibility of retrocausation to two classes of processes, irreversible and reversible. The former have clearly distinguishable causes and effects, involve an entropy increase, and allow for retrocausation. The latter are isentropic, and are inconsistent with causation and with retrocausation, real or apparent, because an increase in entropy must always accompany retrocausation.

* "Entropy and subtle interactions," G. Moddel, *J. Scientific Exploration*, 18 (2), 293-306 (2004).

Secrets of the Platonic Solids: The Ancient Greeks Knew Them and We Can Too! **PERLA MYERS** (Department of Mathematics, University of San Diego, 5998 Alcalá Park, San Diego, CA 92110; E-mail: pmyers@SanDiego.edu).

In a hands-on, inquiry based session, the participants will build polyhedra, and will explore some of their characteristics. Participants will learn about different materials that can be used to create polyhedra in the classroom.

Independent Component Analysis of Mismatched Negativity, **KRISTOPHER NAOWAMONDHOL**, **CYNTHIA GONZALEZ**, **CHRISTINE POURANDRIAS**, **XOCHITL SWANSON**, **LINA TAING**, **BETTY LIAO** and **STAN-**

LEY E. LUNDE (University of California-Los Angeles, A265 Murphy Hall, Los Angeles, CA 90095-1571, Developmental Disabilities Program; E-mail: krisnaow@ucla.edu).

Mismatch Negativity (MMN) is the negative component of the event related potential (ERP) whereby the brain has an automatic, pre-attentive response to discernable changes in repetitive auditory stimuli (Näätänen, 1992). MMN studies have made progress in localization of spatiotemporal patterns of activity in large neuronal populations. However, MMN is a derived measurement, taken as the difference between standard stimuli ERPs and deviant stimuli ERPs that occur at different times. Localizing this difference measure does not identify the cerebral sources present during the deviant responses, when the MMN actually occurs. The present study directly identified sources of the deviant ERP during the time frame of the MMN with independent component analysis (ICA: Bell and Sejnowski, 1995), implemented in EEGLAB (Delorme and Makeig, 2004). Using a modified version of the Näätänen et al. (2004) paradigm, a series of tones consisting of 75ms standards and 25ms deviants ($p \sim 0.09$) were presented to healthy students. Results showed that the largest components for the deviant had similar activations for the MMN in the bilateral frontal cortices, the anterior cingulate gyri, and right supratemporal and temporal cortices. However, the left temporal component seen for the deviant is not evident for the MMN. These components can be localized specifically in 3D space using the new dipole analysis technique just introduced in EEGLAB 5.0 beta. This study contributes to further understanding of the MMN by attempting to identify the actual neuronal sources and has potential clinical application for infants and children with neurodevelopmental disorders because neither attention nor task performance are required.

An Integrated Biomarker-Based Strategy for Ecotoxicological Evaluation of the Venice Lagoon, **CRISTINA NASCI¹**, **EUGENIA DELANEY¹**, **ANDREA BARBANTI¹**, **ANDREA BERTON¹**, **ALBERTO G. BERNSTEIN²**, **CHIARA CASTELLANI¹** and **LAURA MONTOBBIO²** (¹Thetis S.p.A., Environmental Studies and Analyses Division, Castello 2737/f, Venice, Italy; ²Consorzio Venezia Nuova, Environmental Department, Venice, Italy).

The Venice lagoon is a dynamic environment that has been exposed to intense transformation and anthropogenic use, greatly increased during the last century with industrial and agricultural development. In the framework of the project named "ICSEL", promoted by the Venice Water Authority (Magistrato alle Acque di Venezia) through its concessionary "Consorzio Venezia Nuova", and other studies carried out over the past decade to preserve and to manage this unique environment, a chemical-biological approach based on stress indexes or biomarkers has been developed to evaluate ecological pollution impact in the lagoon. Bio-availability (and risk) of contaminant to various components

of the ecosystem is not directly related to absolute concentrations but depends upon environmental (sediment, water) characteristics and ecosystem interactions and function. The use of biomarkers, utilizing sentinel animals as integrators of pollution can provide information on the health status of individuals and population based on relatively small samples of individuals and can link processes of molecular and cellular damage (early warning signals) through to higher levels (prognostic capability).

Biomarker responses in lagoon sentinel organisms, fish and mussel, will be presented in relation to sediment and organism contaminant levels and to sediment toxicity. The usefulness of biomarkers in an integrated environmental management of the Venice lagoon will be discussed.

Anomalous Anticipatory Responses in Networked Random Data, **ROGER NELSON** (Global Consciousness Project, 196 Valley Road, Princeton, NJ, 08540; E-mail: rdnelson@princeton.edu).

We examine an 8-year archive of synchronized, parallel time series of random data from a world spanning network of 60 physical random event generators (REGs). These REG data are not vulnerable to electromagnetic biasing. The archive is a publicly accessible matrix of normally distributed 200-bit sums recorded at 1 Hz which extends from August 1998 to the present. The primary question is whether these data show non-random structure associated with major events such as natural or man-made disasters, terrible accidents, or grand celebrations. Secondly, we examine the time course of any correlated responses.

Statistical analyses of the data reveal consistent evidence that events which strongly affect people engender small but significant effects. Suggestions of anticipatory responses motivate a series of specialized analyses to assess possible non-random structure preceding precisely timed events. A focused examination of data collected around the time of earthquakes with Richter magnitude 6 and greater shows a number of intriguing, potentially important features. Anomalous effects in the REG data are seen only when the corresponding earthquakes occur in populated areas; no structure is found if they occur in the oceans. We infer that an important contributor to the effect is the relevance of the earthquake to humans. Epoch averaging reveals evidence of changes in the data beginning several hours prior to the main temblor, suggestive of retrocausation.

The "Citizen Ethicist" and the Accreditation of Medical Specialists, **PATRICK NICHELSON** (Department of Religious Studies, California State University, 18111 Nordhoff Street, Northridge, CA 91330-8316; E-mail: pnichelson@csun.edu).

Increasingly American boards of medical certification are inviting "public members," such as myself, a Religious Studies Professor, to serve as full voting participants in the

examination of candidates for certification and *diplomate* status as medical specialists. Public members may take part in deliberations concerning policies and appeals for certification, and they may observe oral and written exams. The consequences of the specialist certification processes are high-stake matters not only for the physician candidates, but also for the professional organizations in medicine and for the public community of patients who depend on the knowledge, skill, and sound ethical behavior of specialists. My experience in this process invites questions worth presenting in a forum about the productive convergence of science and humanities. Besides playing the role of civilian overseers in the name of the public interest, what value do public members bring to medical specialist certification itself? Some public members come from allied-health backgrounds, but many are instead trained as professionals in the Liberal Arts. What goods may philosophers, comparative religionists, rhetoricians, or language scholars, all with minimal scientific comprehension, proffer the hard-working physicians who examine and certify medical specialists? Likewise, what new knowledge and insights might the public members bring back to their own workplaces as scholars and teachers in the Humanities? What peculiar challenges face the public members who intend to perform a useful service to the medical societies? Finally, are medical societies promoting democratic values as they voluntarily incorporate non-medical advisers into their professional deliberations?

Secondary Organic Aerosols: Contributions of First and Second Generation Reaction Products, **NGAL NG, JESSE H. KROLL, VARUNTIDA VARUTBANGKUL, JOHN H. SEINFELD, and RICHARD C. FLAGAN** (California Institute of Technology, 210-41, Pasadena, CA 91125; E-mail: flagan@caltech.edu).

Atmospheric reactions of volatile organic compounds produce a range of semivolatile organic compounds that partition to varying degrees between the aerosol phase and the vapor phase. The resulting secondary organic aerosols contribute significantly to the atmospheric aerosol, especially in polluted regions. Two-reaction-product models of gas-particle partitioning have long been used to represent secondary organic aerosol yields in laboratory chamber studies. Recent experiments performed in the Caltech indoor, dual Teflon environmental chambers provide new insights into SOA formation during ozonolysis of biogenic hydrocarbons. Plots of SOA formation versus the amount of hydrocarbon reacted reveal differences in shape of these growth curves that depend on the structure of the VOC that is reacting. From the shapes of the growth curves, it is found that all the hydrocarbons studied can be classified into two groups based entirely on the number of double bonds of the hydrocarbon, regardless of the reaction systems (ozonolysis or photooxidation) and the types of hydrocarbons studied: compounds with only one double bond and compounds with

more than one double bond. For compounds with only one double bond, the first oxidation step is rate-limiting, and aerosols are formed mainly from low volatility first generation oxidation products; whereas for compounds with more than one double bond, the second oxidation step may also be rate-limiting and second-generation products contribute substantially to SOA growth.

Explanation of the Gibbs Paradox within the Framework of Quantum Thermodynamics, **TH.M. NIEUWENHUIZEN** (Instituut voor Theoretische Fysica, University of Amsterdam, Valckenierstraat 65-67, 1018 XE, Amsterdam, The Netherlands; E-mail: nieuwenh@science.uva.nl).

The issue of the Gibbs paradox is that when considering mixing of two gases within classical thermodynamics, the entropy of mixing appears to be a discontinuous function of the difference between the gases: it is finite for whatever small difference, but vanishes for identical gases. The resolution offered in the literature, with help of quantum mixing entropy, was later shown to be unsatisfactory precisely where it sought to resolve the paradox.

Macroscopic thermodynamics, classical or quantum, is unsuitable for explaining the paradox, since it does not deal explicitly with the difference between the gases. The proper approach employs quantum thermodynamics, which deals with finite quantum systems coupled to a large bath and a macroscopic work source.

Within quantum thermodynamics, entropy generally loses its dominant place and the target of the paradox is naturally shifted to the decrease of the available work before and after mixing (mixing work). In contrast to entropy this is an unambiguous quantity. For almost identical gases the mixing work continuously goes to zero, thus resolving the paradox. In this approach the concept of "difference between the gases" gets a clear operational meaning related to the possibilities of controlling the involved quantum states. Difficulties which prevent resolutions of the paradox in its entropic formulation do not arise here.

The mixing work has several counter-intuitive features. It can increase when less precise operations are allowed. In the quantum situation (in contrast to the classical one) the mixing work can also increase when decreasing the degree of mixing between the gases, or when decreasing their distinguishability. These points go against a direct association of physical irreversibility with lack of information.

Use of Neural Network Programming in the Development of a Disciplined and Rational Stock Trading Model to Provide an Innovative and Non-Toxic Source of Capital Funding for Small to Medium U.S. and International Corporations, **AL-FRED J. NIGL** (IntelliStat Consulting Group, 3201 Avenida Magoria, Escondido, CA 92029; E-mail: drnigl@cox.net).

In recent years, it has become increasingly difficult for small, emerging companies to secure adequate financing to

assist them in managing their growth and providing necessary capital. Many companies have been forced to turn to risky non-traditional sources of capital such as PIPEs (private investment in public entities) and hedge funds (Durfee, 2006).

A major problem with both of these alternatives is the tendency for a company's stock price to decline precipitously following the acquisition of such financing; quite often, short selling is a natural consequence of these hedging financing alternatives.

A third non-traditional financing source however is available to most small and medium size companies that, if designed correctly, can have a non-toxic effect on the stock price and help maintain shareholder value over time. Equity (or stock) loans can be structured to be beneficial to the borrowing company by designing a trading model, based on historical price and volume fluctuations (combined with other data sources such as sector trends and new product developments), that statistically enhances the predictability of positive and negative trading effects on the stock price. A trading algorithm based on an Error Correction Neural Network paradigm (Nygren, 2004) is shown to be more effective than other available models in preventing significant negative fluctuations in stock prices and volume. Employing a neural networks model to predict the impact of trading activity offers advantages to both lender and borrower by helping the lender mitigate its financial risk without causing a negative impact on the collateral stock.

Distinct Frames of Reference for the Spatially-Modulated Activity Patterns of Hippocampal and Neocortical Neurons, **DOUGLAS A. NITZ** (Associate Fellow, The Neurosciences Institute, 10640 John J. Hopkins Dr., San Diego, CA 92121; E-mail: nitz@nsi.edu).

With practice, most animals are capable of using spatial awareness to guide the quick and efficient traversal of routes through an environment. To do so likely requires an ongoing integration of information reflecting spatial position in the environment, direction of movement, as well as past and planned actions. While it is well known that the spatial firing properties hippocampal neurons are organized relative to the observable environment as a whole (i.e., activity is allocentrically referenced), it is not known whether activity patterns within neocortical regions contributing to navigational abilities are similarly organized. One possibility is that activity in such regions is organized relative to the body (i.e., is egocentrically referenced). However, recent work examining the spatial firing properties of neurons within parietal cortex and prefrontal cortex in the context of navigational tasks indicates that activity within these regions is not egocentrically-referenced, but instead organized relative to the start and end points of behavioral sequences irrespective of where they are located in allocentric space. In the parietal cortex, such activity patterns take reference to the specific ordering of navigational behaviors (e.g., turns) and the spac-

es between their points of execution. Yet, they do not reflect simple behavioral correlates of individual neurons. In prefrontal cortex, such activity is largely behavior-independent compatible with a referencing of activity relative to the start and end points of a behavioral sequence or possibly to the positioning of reward. Thus, multiple frames of reference for the registration of spatial information are generated simultaneously during navigation through space.

Catalytic Applications of NiWS Nanostructures in Hydrodesulfurization, **A. OLIVAS¹, S. FUENTES¹, E. FLORES¹, and G. ALONSO²** (¹Centro de Ciencias de la Materia Condensada - UNAM, Ensenada, P.O. Box 439036, San Ysidro, CA 92143; ²Centro de Investigación en Materiales Avanzados, Miguel de Cervantes Saavedra No.120, C.P. 31109, Chihuahua, México; E-mail: fuentes@ccmc.unam.mx).

Transition metal dichalcogenides as MoS₂ and WS₂ have been typically used as catalysts and lubricants due to the anisotropic character derived from their layer structure. A new form of these materials involving closed structures (inorganic fullerenes) which presents entirely new properties has been reported by Tenne et al (1). The aim of the present work is to synthesize inorganic fullerenes of nickel-tungsten sulfide with an atomic ratio (Ni/Ni+W) R= 0.85 and evaluate their catalytic behavior in the reaction of hydrodesulfurization (HDS) of dibenzothiophene (DBT).

High resolution electron microscopy (HRTEM) micrographs revealed the formation of two types of nanostructures, nickel sulfide nanoparticles and long nanorods of tungsten suboxide, both coated by WS₂ layers. The Ni/W catalyst containing mostly nanorods presented twice the catalytic activity (pseudo-zero order constant rate $k = 12 \times 10^{-7}$ mol/s.g) of the Ni/W catalyst containing nanoparticles ($k = 6.3 \times 10^{-7}$ mol/s.g) with a low selectivity for tetrahydrodibenzothiophene and high selectivity to cyclohexylbenzene CHB, 50mol %).

Reference

1) Y. Rapoport, Y. Bilik, M. Feldman, S. R. Homeyoffer, R. Cohen and R. Tenne, Nature 387 (1997) 791-793.

World's Declining Petroleum Production and Solutions Being Currently Adopted, **HENRY OMAN** (Consulting Engineer, 19221 Normandy Park Drive, Seattle WA 98166; E-mail: h.oman @ ieee.org).

Petroleum, a hydrocarbon fuel that is pumped out of deep underground reservoirs, has been an economical energy source for generating electric power with 60% efficiency in combined-cycle power plants. Petroleum products propel automobiles that have at best had around 23% efficiency. The United States annual petroleum production peaked at 94 million barrels a day in 1973, and had dropped to 47 million barrels a day in 2004. Most of our nation's petroleum is used to propel automobiles, and improving their efficiency has not been encouraged. The world's petroleum production is expected to peak at 125 million barrels a day and start declining by 2030. Other nations are already taking effective measures

to reduce their consumption of petroleum, the cost of which rose from \$24 to \$75 a barrel in the last three years. For example, China's production of battery-powered electric bicycles has grown to over 3 million per year. Their new hydro power plant on the Yangtze River generates 18-gigawatts of electric power. This power, if it could be distributed throughout nation, could propel every man, woman, and child a distance of 53 miles, every day, on electric bicycles. New nuclear power plants are also being built in China. Efficient battery-powered electric cars are being adopted in European and Asian countries. For example, the tZero two-passenger battery-powered electric car was able to traveled 150 miles at a speed of 50 miles per hour by consuming 33.8 kWh of electric power that equals the energy in one gallon of gasoline. This electric energy would have cost \$3 in Seattle, WA.

High-Efficiency Achieved in Nature's Propulsion Muscles, **HENRY OMAN** (Consulting Engineer, 19221 Normandy Park Drive, Seattle WA 98166; E-mail: h.oman @ ieee.org).

The Carnot Cycle law limits the achievable efficiency in "heat engines," such as those that propel automobiles and drive generators in power plants. This limit is the temperature difference between the heat source and heat sink, divided by the absolute temperature of the heat source. The best electric power generating plant that has a combined-cycle steam turbine achieved 63% efficiency when fully loaded. The best automobile engines have an efficiency of around 23% when delivering rated output power. In contrast, animal muscles that use a sugar-type fuel can deliver output force with an efficiency of over 95%. Consequently, the dolphin can swim 2075 miles by consuming food with the energy in one gallon of gasoline. It vibrates its skin to avoid the power loss from generating turbulent-flow losses in the water flowing past its skin. Plants efficiently produce the carbohydrate fuel that muscles consume in producing propulsion power. Plant leaves absorb the ultraviolet photons that arrive in sunlight to electrolyze root-delivered water into oxygen, which is released, and hydrogen. The sunlight's red and infrared photons separate carbon from carbon dioxide, which is extracted by the leaves from the atmosphere, to produce carbon. Carbon and hydrogen are combined into carbohydrates that go into growing the plant's structure, leaves, flowers, and fruit. At one time horses and oxen that ate hay and wheat pulled carriages and wagons that hauled people and freight, without a being efficiency-limited by the Carnot-cycle law. With today's technology the carbohydrates in plant leaves can be used to produce ethyl alcohol. Hydrogen extracted from alcohol can be fed into fuel cells that deliver vehicle-propulsion power. In China alcohol-consuming fuel cells are being developed for propelling buses that will haul passengers at the 2008 Olympics that China will host.

Nanotechnology, a Route to High Propulsion Efficiency, **HENRY OMAN** (Consulting Engineer, 19221 Normandy

Park Drive, Seattle WA 98166; E-mail: h.oman @ ieee.org).

Nanotechnology, a new science that deals with activity within the nucleus of atoms, as well as in their surrounding electrons, is progressing. This research can result in power sources that don't have to comply with Carnot-cycle efficiency limits. For example, one plant within its structure already generates a high voltage-to-ground at the end of its leaf-stem in order to deliver a spark that reaches an approaching animal. The animal then retreats. An Amazon-river fish generates a directed electric pulse that disables its food-prey. Described at the 2005 AAAS Pacific Div. Meeting is the nanotechnology-based light-emitting diode, which consumes only 5 watts of electric power when it delivers the illumination of a 60-watt filament light bulb. Developed in China is package in which a light-emitting diode lamp that is powered by a battery, which is recharged by an attached solar-cell panel. These lamps are already mass-produced and are being shipped to remote regions in China, India, and Africa where electric power isn't available for students who need to study lessons after dark. New nanotechnology instruments are searching for ways of producing and consuming electric power efficiently.

A Study of Dietary Intake of Lutein/Zeaxanthin Among Modern Americans, **UYI E. OSASERI**¹, **SHIU Y. KWOK**², **WENDY KWOK**², and **CHICK F. TAM**³ (¹UCLA/Charles R. Drew University College of Medicine, 1731 E. 120th Street, Los Angeles, CA 90059; ²Department of Ophthalmology, University of California, San Francisco, 10 Koret Way, San Francisco, CA 94143; ³School of Kinesiology and Nutritional Science, California State University at Los Angeles, 5151 State University Dr., Los Angeles, CA 90032; E-mail: uosaseri@ucla.edu).

Lutein and its isomer zeaxanthin are important anti-oxidants to maintain good health of the body. They can only be obtained from food. Low intakes of lutein/zeaxanthin increase the risk of breast cancer, colon cancer, age-related macular degeneration and other aging conditions. This paper surveyed food choices rich in lutein/zeaxanthin among a sample of health conscious college students and their live-in parents. The purpose of this study was to assess the amount of lutein/zeaxanthin intake in people of diverse ethnic background, gender and age. Three day dietary records from 95 nutrition science undergraduate students were reviewed. They were compared with the records of an equal number of their live-in parents. The study subjects were 76 African Americans (38 young AA, 38 old AA; 55 females and 21 males) and 114 Caucasian Americans (57 YC, 57 OC; 77 females and 37 males). Individuals in this study had an average of 2.5 servings of fruits and vegetables a day. It was calculated that they consumed approximately 2 mg per day of lutein/zeaxanthin from their regular diets. The statistical analyses of ethnic, gender, and age subgroups were performed. There was no statistical difference in food consumption and lutein/

zeaxanthin intakes among the several ethnic, age and gender groups. Both the recommended daily consumption of 5 to 9 servings of fruits/vegetables and the daily intake of 6 mg/day of L/Z (Seddon, 1994; U.S. Surgeon General 1999) were not met by this study population. Great effort in educating the public is needed.

Academic Technology Transfer: A model for University-Industry Partnership, **ALAN PAAU** (University of California, San Diego Technology Transfer and Intellectual Property Services, 9500 Gilman Drive, # 0910, La Jolla, CA 92093-0910; E-mail: apaau@ucsd.edu).

The missions of most, if not all, universities invariably encompass (i) the creation of new knowledge and art, (ii) their dissemination, and (iii) services to the community. Much of the knowledge and art generated may be considered as intellectual property (IP) under various intellectual property laws and multinational treaties. The proper dissemination of IP and the utilization of IP to provide meaningful services to the community require appropriate IP management.

University management of IP is not new and can be traced back in many countries, including the U.S., to when society was highly agronomic. As many countries develop or plan to develop into more knowledge-based economies, proper IP management will pay an increasingly essential role. IP management, because of its "intangible" nature, often requires very specialized skills that combine science and technology understanding, business acumen, understanding of certain legal disciplines, and suitable personalities. This section provides an overview of why universities manage IP.

Dementia and Alzheimer's Disease; Nosology of Fallacy, **FRED C. C. PENG** (Department of Neurosurgery and Neurological Institute, Taipei Veterans General Hospital, Taipei, Taiwan; E-mail: pengf001@hawaii.rr.com, fccp@cronos.ocn.ne.jp).

Alzheimer's disease (AD) has been known since the eponym made by Kraepelin in 1911. It is claimed to consist of two hallmarks: senile plaques and neurofibrillary tangles. Upon reviewing the literature, I have found that this claim is utterly false, which has been taught as such at every medical school throughout the world; Alzheimer NEVER made any original histopathologic description of senile plaques, for which he spent only two sentences, although he did briefly describe "the transformation of fibrils." It was Oskar Fischer who made the most extensive and detailed description of 16 cases with eight histopathologic illustrations of both diseases to support it.

I have made a thorough examination of the two publications in 1907 by Fischer, whose article was a lengthy one of 12 pages, and Alzheimer, whose case report was barely two pages long. I shall compare them and point out that it is unfair to Fischer and the general public to allow the false claim

to stand unchallenged. I conclude that the eponym, AD, is a misnomer, committed by Kraepelin, which has misled the entire medical field for so long. A new eponym is therefore proposed: Fischer-Alzheimer's diseases (FADs) in the plural or Fischer-Alzheimer's Syndrome (FAS).

Turbulent Dispersion in Stably Stratified Homogeneous Shear Flow, **LINHDUNG PHAM, JAMES W. ROTTMAN, and KEIKO K. NOMURA** (Department of Mechanical and Aerospace Engineering, University of California, San Diego, La Jolla, CA 92093-0411; E-mail: lpham@ucsd.edu).

An important property of turbulence is its ability to disperse contaminants and mix scalar quantities. Turbulent dispersion in the atmosphere is complicated by the presence of stable stratification and shear. In stably-stratified flow, fluid particles are constrained to stay within a vertical distance of order w/N from their equilibrium density level, where w is the rms vertical component of turbulent velocity and N is the local buoyancy frequency of the fluid. However, molecular diffusion can alter the density of fluid particles which, in turn, alters the equilibrium level about which they oscillate with amplitude w/N . Thus, the vertical flux of density in a stratified turbulent flow is the result of two processes: the first is the vertical displacements of fluid particles and the second is the molecular mixing between fluid particles. These ideas are the basis of the theory of Pearson, Puttock and Hunt (1983), valid for statistically stationary homogeneous turbulence. In the present work, we test these ideas and investigate the presence of mean shear. Direct numerical simulations are performed to study turbulent dispersion in stably stratified homogeneous shear flow. A range of stratification levels corresponding to subcritical, critical, and supercritical flow conditions, which are associated with growing, stationary, and decaying turbulence, respectively, is considered. Lagrangian statistics are obtained by tracking fluid particles. Results show the effects of shear on vertical and horizontal displacements and the role and significance of molecular mixing.

Polymer Micro-Cylindrical Waveguide Based Protein Biosensor, **SHALINI PRASAD¹, SUDHAPRASANNA KUMAR PADIGI¹, KOFI KASAANTE², RAVI KIRAN KONDAMA REDDY¹, VIJAY SEK HAR REDDY KOVVURI¹ and ANDRES LA ROSA²** (¹Department of Electrical Engineering, Portland State University, Portland, OR; ²Department of Physics, Portland State University, Portland, OR; E-mail: sprasad@pdx.edu).

We have developed a micro-photonic cylindrical waveguide for the detection and characterization of protein-anti protein binding. The cylindrical waveguides were fabricated using standard photolithography on photo-sensitive polymer. We have characterized the device using 632.8nm red laser. The waveguide was excited through an etched silica fiber tip. The measurement system comprised of lock-in amplifier

and a chopper for providing the reference. The proteins that were characterized were: CRP-AntiCRP, MPO-AntiMPO. These proteins are very useful in the early bed detection of vulnerable plaque that leads to fatality in post operative scenario. The response time of the sensor is on the order of milli seconds. These sensors were tested for a concentration of 10ng/ml. The experiments were repeated for $n = 3$ times, to establish repeatability and robustness in the detection process.

Carbon Nanotube Based "Electronic Nose" For Detection Of Aliphatic Hydrocarbons, **SHALINI PRASAD and SUDHAPRASANNA KUMAR PADIGI** (Department of Electrical Engineering, Portland State University, Portland, OR; E-mail: sprasad@pdx.edu).

A hybrid Multi-Walled Carbon Nanotube based chemical sensor was designed and developed by integration of microfabrication techniques with nano-assembly. This integrated sensing mechanism on a chip, comprised of thiol functionalized Multi-Walled Carbon Nanotubes (MWCNT) that functioned as transducers which were integrated with micro-electrode array measurement sites. The detection of the four fundamental hydrocarbons belonging to the aliphatic hydrocarbon family-Methanol, Ethanol and Butanol was experimentally demonstrated. High degree of selectivity was demonstrated by repeated robust identification of individual hydro carbons belonging to the same family. The sensor demonstrated 1 ppm detection sensitivity. The detection mechanism was based on nano-scale transduction of the detection of the localized binding event between the functional binding sites and the chemical species of interest. Specific electrical signatures for each of these chemicals were identified using multiple levels of data analysis comprising of Fast Fourier Transformation (FFT) and Power Spectral Density (PSD). The sensor demonstrated a rapid response time with portability, accuracy and versatility for the in-situ detection of multiple chemical agents, with potential for automation.

Laboratory Modeling of a Simple Urban Environment, **MARKO PRINCEVAC, TAYLOR RAY COLE, and XIANGYI LI** (University of California, Riverside, Riverside, CA 92521; E-mail: marko@engr.ucr.edu).

Urban boundary layer simulations were performed in the water channel at the University of California, Riverside, in the Laboratory for Environmental Flow Modeling. A recirculating water channel was utilized to create controlled flow field. Building configurations simulating simple urban patterns were accomplished using highly polished acrylic models to minimize effects of refraction and attenuation of the laser sheet utilized by the Particle Image Velocimetry system. Using a simple two building configuration the effects of channeling were studied and distribution of the turbulent kinetic energy was measured. The occurrence of flow channeling vs. flow recirculation was observed throughout

experimentation. The criteria for channeling occurrence in this 2 building configuration was established. When the flow approach angle is greater than the critical value of ~ 5 degrees, for building setups in the skimming regime, it was noticed that the flow velocity no longer affects the channeling occurrence and channeling is always observed. For the flow approach angles smaller than the critical angle, increase of flow velocity will eventually lead to the channeling in all cases. In a phase that exists between pure channeling and no channeling, the recirculation regions and vortex shedding are observed. The distribution of turbulent kinetic energy (TKE) around the buildings was related to the building geometries and approaching flow conditions.

The Hypotenuse: The Pathway of Peace, **CARLOS E. PUENTE** (Department of Land, Air and Water Resources, University of California, Davis, 223 Veihmeyer Hall, Davis, CA 95616; E-mail: cepuente@ucdavis.edu).

The last few decades have witnessed the development of a host of ideas aimed at understanding and predicting nature's ever present complexity. It is shown that such a work provides, through its detailed study of order and disorder, a suitable framework for visualizing the dynamics and consequences of mankind's ever present divisive traits. Specifically, this work explains how recent universal results pertaining to multiplicative cascades and fully developed turbulence entice all of us, in a logical way, to seek peace in a condition typified by the hypotenuse of a right-angled triangle.

Psychophysiological Tests of Possible Retrocausal Effects in Humans, **DEAN RADIN** (Institute of Noetic Sciences, 101 San Antonio Road, Petaluma, CA 94952; E-mail: deanradin@noetic.org).

If the human nervous system operates exclusively according to conventional causal assumptions, then pre-stimulus physiological levels should be independent of randomly selected future stimuli. But if meaningful dependencies occur, it would suggest that the nervous system may be sensitive to retrocausal effects.

To test this idea, a series of experiments were conducted to investigate whether pre-stimulus physiological measures were meaningfully related to post-stimulus responses under conditions where the stimuli could not be inferred. Under double-blind conditions, skin conductance levels of individuals were recorded before, during and after exposure to randomly selected calm or emotional pictures. Pre-stimulus skin conductance levels prior to calm and emotional trials showed a significant differential response ($N = 131$ participants, 4,569 trials, $p = 0.00003$), in accordance with the hypothesis that the autonomic nervous system responds in accordance with the emotionality of an upcoming random stimulus. Numerous conventional explanations for these effects have been examined and rejected as implausible. This experiment has been successfully replicated by independent investiga-

tors, and new designs examining pre-stimulus changes in heart rate and slow cortical potentials, and using audio tones and light flashes as stimuli, confirm the effect. These studies challenge the notion that human psychophysiology can be modeled solely by unidirectional processes.

A Macroscopic Method to Separate Inner-Sphere from the Outer-Sphere Equilibrium Surface Complexes in Aqueous Electrolyte Solutions, **ANPALAKI J. RAGAVAN¹ and V. DEAN ADAMS²** (¹Department of Mathematics and Statistics, University of Nevada, Reno, Nevada 89557; ²Department of Civil and Environmental Engineering, University of Nevada, Reno, Nevada 89557; E-mail: ragavan@unr.edu).

A major source of error in the use of mass action laws for surface reactions occurs through improper separation of the inner from the outer-sphere surface complexes at equilibrium. In aqueous solutions the outer-sphere surface complexes have at least one water molecule interposed between, the adsorbate species and the adsorbent site to which they are bound, to form an adsorption complex. An inner-sphere surface complex, by contrast has no water molecule interposed between the adsorbate species and the adsorbent site that binds it, although the inner-sphere surface complex may be partially solvated by water molecules that do not intervene in their bond to the adsorbent site. Currently there is no accurate method available to separate the inner- from the outer-sphere surface complexes at equilibrium.

A method was developed in this research to separate the inner- from the outer-sphere surface complexes at equilibrium, using molecular parameters such as solvent dielectric constants, electric fields near solid surfaces and the distance of the adsorbed ion from the solid surface. Significantly larger desolvation coefficients derived for the inner-sphere surface complexes separate them from the partially hydrated outer-sphere surface complexes of the same ion at all ionic strength of the medium. The inner-sphere surface complexes thus will have significantly larger complexation constants at equilibrium than the outer-sphere surface complexes of the same ion at all experimental conditions.

Ecological and Geochemical Responses of Living (Stained) Benthic Foraminifera to Contamination Gradients in the Venice Lagoon, Italy, **A. RATHBURN^{1,2}, M. E. PEREZ¹, J. KLUESNER¹, C. BASAK¹, C. GRAY¹, E. BROUILLETTE¹, and J. GIESKES²** (¹Geography, Geology, and Anthropology, Indiana State University, Science Building 159, Terre Haute, IN 47809, E-mail: gerathbu@isugw.indstate.edu; ²Scripps Institution of Oceanography, UC San Diego, 9500 Gilman Drive, La Jolla, CA, 92093-0218, E-mail: jgieskes@ucsd.edu).

The ecology and geochemistry of living benthic foraminifera in the Venice Lagoon was assessed as part of an ongoing international effort examining the biota and chemistry of Lagoonal sediments (SIOSED). Vertical distribution

patterns of living (Rose Bengal-stained) foraminiferal assemblages (>150 μ m) were examined in sediments from push cores taken on a transect of contaminated sediments within the Lagoon. Calcareous taxa comprised over 90% of foraminiferal assemblages at sites within class B, and C contamination zones, whereas agglutinated taxa dominated the site within the class A contamination zone. At a site within zone B, maximum foraminiferal assemblage densities occurred at the surface (0-1cm), whereas a site within zone C (the most contaminated zone) had an infaunal density maximum. Dominant taxa at sites within B, and C zones included: *Ammonia* sp., *Haynesina* sp., and *Quinqueloculina* sp. Dominant taxa at the site within zone A (the least contaminated zone) included: *Reophax* sp. Foraminifera were assessed for abnormal test morphologies that previous studies of other areas suggest may be related to the existence of contaminants in the sediments. Initial results indicate that some trace element concentrations, including zinc/calcium concentration ratios, in foraminiferal calcite are very different between sites. Differences in foraminiferal populations, aberrant morphologies and geochemical signals at sites A, B, and C may be related to bioavailable pollutant concentrations. Results may provide calibration data for contaminant proxies of spatial and temporal environmental differences.

The "SIOSED" project is part of a comprehensive effort to support the integrated management of Venice Lagoon sediments and ecosystems promoted by the Venice Water Authority through its Concessionary, Consorzio Venezia Nuova.

Carnot is Not Universally True, **KENNETH M. RAUEN** (345 Sheridan, Apt. 212, Palo Alto, CA 94306; E-mail: kmpr27@yahoo.com).

Carnot's Theorem is believed to be universal in scope, just like the Second Law of Thermodynamics. Carnot's Theorem is based upon a series of logical and mathematical arguments. The premises and intermediate conclusions that underpin Carnot's Theorem are identified and critiqued. Several errors have been found, the significance of which is the Theorem and the Second Law are not universal in scope.

Critique of Wheeler's "Critique of 'Centrifugal Gas Compression Cycle,'" **KENNETH M. RAUEN** (345 Sheridan, Apt. 212, Palo Alto, CA 94306; E-mail: kmpr27@yahoo.com).

Roy Fultun presented a thought experiment at the First International Conference on Quantum Limits to the Second Law, that centrifugal compression of a gas is isothermal and adiabatic. Rotational kinetic energy is given to the gas to compress it and that rotational kinetic energy is recoverable as work, thus circumventing the Second Law. John C. Wheeler rebutted Fultun's argument with a mathematical proof, stating that heat is released in centrifugal compression, thus conforming to the Second Law. Re-analysis of Wheeler's argument shows his math is correct but the assignments of the mathematical entities to the physical phenomena are wrong. The correct analysis is a mathematical proof

that centrifugal gas compression allows the Second Law to be circumvented under reversible conditions, allowing a perpetual motion machine of the second kind to exist, tapping the heat of the environment.

The Proell Effect and the Superclassical Heat Engine Cycle, **KENNETH M. RAUEN** (345 Sheridan, Apt. 212, Palo Alto, CA 94306; E-mail: kmpr27@yahoo.com).

The non-homogeneous constant volume (isometric) process with displacement and regeneration is re-analyzed from classical analysis and is found to have heretofore unrecognized heat flows that create a spontaneous separation of heat with an applied perturbation, forming a macroscopic Maxwell's Demon, named after its discoverer, Wayne Proell. The concepts of self-refrigeration and self-heating are introduced. The author presents experimental evidence of this effect and presents one embodiment of the Proell effect in a useful device, the Superclassical heat engine cycle. The SCE is a three-step engine cycle composed of isometric cooling, isentropic compression, and isobaric expansion, which recycles unconverted heat in the cycle from its lowest temperature back to its highest temperature, with no work input under reversible conditions, through the Proell effect. The asymmetrical cycle with one isometric process allows a net Proell effect in the Superclassical cycle that does not show up in the Stirling cycle. Carnot's Theorem is exceeded and the Second Law is circumvented. The science is totally identified and is consistent with the details of classical thermodynamics; only the generality of the Second Law, its universality, is "violated." Math proofs are presented with full, traceable thermodynamic state variables.

Nano Monitors for Identification of Vulnerable Cardio-Vascular Plaque, **RAVI K. REDDY¹, SHALINI PRASAD¹, THOMAS W. BARRETT², CORY BYSTROM³, and JOHN R. CARRUTHERS⁴** (¹Department of Electrical and Computer Engineering, Portland State University, Portland, OR; ²Internal, Hospital And Perioperative Medicine, Portland Vamc, Oregon Health Sciences University, Portland, OR; ³Proteomics Shared Resource, Oregon Health Sciences University, Portland, OR; ⁴Department Of Physics, Portland State University, Portland, OR; E-mail: ravikk@pdx.edu).

As our nation's population ages, there will be a substantial demand for surgical services. The best predictor of post-operative outcome is the presence of perioperative ischemia, which is caused by vulnerable

coronary plaque rupture. It is not know what makes plaques rupture, but inflammation has been proposed as a unifying etiology. The physiologic perioperative state is one of intense, acute inflammation and thrombosis. This is characterised by the presence of proteins - Human Serum C-Reactive Protein (hsCRP) and Myeloperoxidase (MPO). There is a *gap* in detection capability between gold standard in proteomics detection -Enzyme Linked Immunosorbent

Assay (ELISA) assay methods and electrical biosensors. ELISA based protein biomarker detection is too slow to be applicable in early patient bedside treatment.

Electrical biosensors on the other hand may overcome this limitation with their improved sensitivity, specificity and rapid detection. In this application we demonstrate the development of nanomembrane based electrical protein “nano monitor.” This technique overcomes the limitations current “state-of-the-art” methods such as:

- Specificity in detection of multiple markers that characterizes the disease pathogenesis from a single marker to multiple markers.
- Speed of detection from a turnaround time of 12/24 hours to a few minutes.
- Sensitivity of detection from milligram/ml to nanogram/ml.

Using Classroom Performance System (CPS) to Gauge Conceptual Understanding in the Biology Classroom, **ERIN REMPALA** (Biology Department, San Diego Mesa College, 7250 Mesa College Dr., San Diego CA 92111; E-mail: erempala@sdccd.edu).

Various active learning techniques utilized to engage undergraduate non-majors science students within lecture classes. Students partake in activities such as: critiques of one another’s work, pre-quizzes on concepts to be discussed during class, discussion groups based on critical thinking questions, think-pair-share, minute papers, review of last class’s “minutes” at the beginning of the next class, breakout sessions during class to discuss main concepts or answer a concept question. I varied teaching methods, and implement peer instruction, so students could become adept at critical thinking, rather than simply memorizing facts. Furthermore, it is hypothesized that with practice, students will become more effective problem-solvers by the end of the semester. Success will be measured by utilizing a standard set of topic specific core review questions designed to test conceptual understanding. These questions will be administered immediately after students have engaged in a learning activity. Feedback from students’ responses will be available instantly during class, to both the students and the instructor, using EInstruction’s Classroom Performance System (cps). Responses will give an indication of the level of student understanding and any continued misconceptions. Initially, this data will help the instructor to focus on conceptual material for pre-test review sessions, or future activities and assignments. With successive semesters, topic specific data trends may develop, which give an overall indication of commonly held misconceptions to focus on during lecture.

Seagrass Distribution in Venice Lagoon: Spatial-Temporal Dynamics as a Result of Physical Pressures and Disturbance Factors, **ANDREA RISMONDO, DANIELE CURIEL, and FRANCESCO SCARTON** (SELCO Soc. coop., via del-

l’Elettricità 3/d, I-30175 Venezia-Marghera; E-mail: rismondo@selco.it).

The Lagoon of Venice, at the top of the Adriatic Sea, has an area of about 550 km² and an extension north to south of about 40 km. As the result of the progressive cut off of sediment input to the lagoon, there is now a net loss of sediments of about 10⁶ m³/yr. The shallow bottoms of the Lagoon host extensive intertidal salt marshes and are partially vegetated by wide meadows of seagrasses, especially in the southern basin.

Marine seagrasses - *Zostera marina* Linnaeus, *Nanozostera noltii* (Hornem.) and *Cymodocea nodosa* (Ucria) Ascherson - play an important role in the Venice lagoon ecosystem by reducing erosion, improving water clarity, trapping suspended material, and by accumulating organic and inorganic materials. This results in structured benthic communities and increases the macrofauna diversity (Fonseca, 1990). Also, seagrasses decrease turbidity and resuspension, thereby reducing the need for maintenance channel dredging.

We mapped the submerged aquatic rooted vegetation of Venice Lagoon in the framework of a monitoring project carried out by Consorzio Venezia Nuova, on behalf of the Venice State Water Authority (Magistrato alle Acque di Venezia). This project (MELa2), carried out in 2002, 2003 and 2004, also monitored zoobenthic communities, and determined presence, coverage, and short and long term spatial-temporal dynamics of the three seagrass species after an initial 1990 assessment made by Caniglia et al., 1990. *Zostera marina* now covers an area of 3442 ha² (3642 in 1990). *Cymodocea nodosa* now covers an area of 2945 ha² (1634 ha² in 1990) and *Nanozostera noltii* is found on 633 ha² (4141 in 1990). The results of our monitoring indicate a small loss of *Nanozostera noltii* in the inner parts of the lagoon, an increase of *Zostera marina* in the central basin of the lagoon, and a positive trend in coverage by *Cymodocea nodosa* apart from strong local reductions close to Chioggia (southern basin) caused by artificial removal by clam collectors (Magistrato alle Acque, 2003).

A general overview of species dynamics presented in Rismondo et al. (2003a; 2003b) underlines differences in meadows extensions between 1990 and 2002. Local disturbance factors, directly linked to human activities or simply consisting of natural trends are the cause of strong retreats, disappearance of large seagrass beds, and changes in species distribution on smaller scales. Some phenomena have not yet been explained. Large extensions of bare tidal flats are now present around salt marshes, where *N. noltii* used to be abundant in the past. The causes of this loss are probably linked to the variations in the environmental parameters that influence species occurrence, such as water temperature, turbidity, bottom grain size, etc.

In the southern portion of the lagoon, our investigation included clam cultivation (in authorized parcels) and clam

fishing (in the open lagoon) and determined stress for seagrass beds. Our work indicates that a pattern of individual environments and different trends can be observed in the Venice Lagoon, each affected by different “pressures”, including different biotic components, different sediment characteristics, different hydrodynamics, etc.

Several mitigating measures to improve seagrass coverage in the lagoon may be considered, especially those that would decrease the impact of clam cultivation on its distribution. In order to keep biodiversity at reasonable levels and avoid high seagrass fragmentation, these measures must also promote the partial recovery of beds around cultivation parcels and the use of open vegetated areas between parcel and parcel as *buffer zones* to reduce erosion,

References

- Caniglia, G., Borella, S., Curiel, D., Nascimbeni, P., Paloschi, F., Rismondo, A., Scarton, F., Tagliapietra, D. and Zanella, L., 1990. “Cartografia della distribuzione delle fanerogame marine nella Laguna di Venezia”. *Giorn. Bot. Ital.*, 124(1), 212.
- Fonseca M. S., 1990 – Regional analysis of the creation and restoration of seagrass systems. In: Wetland creation and restoration, Kusler J.A. and Kentula M.E. (eds), Island Press.
- Magistrato alle Acque, 2005. Attività di monitoraggio ambientale della Laguna di Venezia. Esecutivo del 2° stralcio triennale (MELa2). Rilievo delle fanerogame marine in Laguna di Venezia con taratura di un sistema di telerilevamento e completamento delle conoscenze sulle macroalghe. Resoconto finale della distribuzione della vegetazione acquatica sommersa (fanerogame marine e macroalghe) in Laguna di Venezia. Rapporto finale. Esecutori: SELC e Thetis.
- Rismondo A., Curiel D., Scarton F., Mion D., Pierini A., Caniglia G., 2003a. Distribution of *Zostera noltii*, *Zostera marina* and *Cymodocea nodosa* in Venice Lagoon. *Flooding and Environmental Challenges for Venice and its Lagoon: State of the Knowledge 2003. International Discussion Meeting - Cambridge, 14th – 17th September 2003*.
- Rismondo A., Curiel D., Scarton F., Mion D., Caniglia G., 2003b. A New Seagrass Map for the Venice Lagoon. In: *Proceedings of the Sixth International Conference on the Mediterranean Coastal Environment*, MEDCOAST 03, E. Özhan (Editor), 7-11 October 2003, Ravenna, Italy. Vol.II. 843-852.

Electromagnetics and Subsurface Mapping: A Minimally Invasive Approach for Meeting Global Water Demand, **PAUL ROLLINS**, (Willowstick Technologies, 11814 South Election Road, Suite 100, Draper, UT 84020; E-mail: prolins@willowstick.com).

The accurate characterization of subsurface aqueous features—from potable aquifers to geothermal reservoirs—is of critical importance to a growing global population demanding both clean water and clean power. This paper analyzes a new water mapping methodology which shows particular potential for meeting that demand, addressing both the theoretical science involved and the practical lessons learned in its recent applications.

In its essence, the methodology is rather simple: Strategically placed electrodes charge the groundwater system with an electrical current. The current then fills the network, concentrating to a greater extent in areas of higher total dissolved solids or higher ion content. In accordance with the Biot-Savart law, this current emits a magnetic field characteristic of the aqueous features through which it courses. The emitted field can then be read by a specially tuned receiver; after passing through a series of filters, the data thus received can generate reliable images of water systems lying up to and beyond 1 km beneath the earth’s surface.

The troubling irony of the world’s resource crisis is that the demand for water is greatest in the semi-arid regions of Asia and Africa, places without the financial means to conduct elaborate hydrogeological surveys. Because this method requires fewer well shafts than traditional imaging technologies—thereby involving less time, expense and environmental trauma—it may be particularly well suited it for the pressing needs of a thirsty world.

Emotional Arousal, Amygdala Activation and Memory, **BENNO ROOZENDAAL** (Center for the Neurobiology of Learning and Memory and Department of Neurobiology and Behavior, University of California, Irvine, CA 92697-3800, USA; E-mail: broozend@uci.edu).

Emotionally significant experiences are typically well remembered. I will summarize recent findings examining the brain mechanisms that are involved in strengthening memories of emotionally arousing experiences. It is now well established that glucocorticoid hormones (cortisol in humans, corticosterone in rodents), released from the adrenal cortex during emotionally arousing experiences, enhance the formation of lasting memory. Glucocorticoid effects on memory enhancement rely on noradrenergic activation of the basolateral complex of the amygdala (BLA) and interactions of the BLA with other brain regions. Such findings strongly suggest that synergistic actions of glucocorticoids and emotional arousal-induced noradrenergic activation of the BLA constitute a neural mechanism by which glucocorticoids may selectively enhance memory consolidation for emotionally arousing experiences. In contrast, working memory and the retrieval of previously acquired information are impaired during emotionally arousing conditions with high circulating levels of glucocorticoids. Glucocorticoid-induced modulation of these memory functions also requires the integrity of the BLA and that of the noradrenergic system. These findings provide compelling evidence that the BLA is part of an integrated network of cortical and subcortical brain regions engaged in regulating the dual effects of emotional arousal on different aspects of memory function.

Research supported by MH12526 Grant from NIMH.

Williams Syndrome: Behavioral Patterns and Interventions, **SUE R. ROSNER¹ and ELEANOR SEMEL²** (¹Emeritus Professor, Psychology, University of Iowa, 8687 Dunaway Dr, La Jolla, CA 92037; ²Professor Emerita, Boston University, 2897 Via Posada, La Jolla, CA 92037; E-Mail: suersr@aol.com).

Williams syndrome (WS) is a rare, genetic developmental disorder with distinctive characteristics: physical, medical, intellectual, behavioral, and academic. The behavioral characteristics of WS pose extraordinary challenges to those who try to rear, teach, treat, and understand individuals with this condition (WSs). This paper describes the unique behavioral profile of WS and interventions specifically designed

for WSs.

Paradoxical Behavioral Patterns: The prototypic behavior profile of WS includes: language ability (e.g., extensive vocabulary), problems with language pragmatics (e.g., verbosity); mental retardation (mostly moderate, mild, some low normal); sociability (e.g., engaging personality, unusual empathy), overfriendliness, peer difficulties; visual-spatial problems and remarkable face processing skills; motor deficits, quantitative difficulties. Other characteristics include: auditory hypersensitivity, musicality, good auditory memory, poor long-term memory, interest in specialized topics and objects. Behavior problems, such as distractibility, fears and anxieties, rigidity, and low frustration tolerance also occur.

Intervention Strategies: The verbal-social tendencies of WS hold the key to effective use of reinforcement (verbal praise, personal disapproval, social interaction) and control mechanisms (rehearsal, verbal mediation, self-talk, role-play, dramatization). Skills, talents (e.g., musicality, play-acting) and special interests are important in providing social opportunities and enhancing academic skills. Perceptual-motor vulnerabilities (i.e., auditory hypersensitivity, motor fears), cognitive limitations, and low self-esteem are negative factors that often undermine performance. Behavior problems may be reduced through use of external controls (i.e., decrease extraneous stimulation, maintain stability, simplify tasks, reduce stress, and bolster self-esteem).

To conclude, this distinctive mix of characteristics and interventions makes WS a most challenging and gratifying condition to study, treat, and teach.

Technology Transfer, Entrepreneurism, Skilled Workers, and Finance the Ingredients of Starting Technology Businesses, **DUANE ROTH** (CONNECT, 8950 Villa La Jolla Drive, Suite A-124, La Jolla, CA 92037; E-mail: djroth@connect.org).

There are certain core requirements for establishing innovative clusters which include research based institutions from which new knowledge is gained, an efficient and effective technology transfer process to the private sector, skilled workers that can develop the technology into products, and risk capital to invest in the enterprise. While many regions in the world possess these basic core competencies, only a few have developed into innovative clusters. Some of the key contributors to the success of the San Diego innovation clusters will be discussed.

Teaching Tips Exchange Session: Teaching Critical Thinking, **JERRY RUDMANN¹** and **ANN EWING²** (¹Department of Psychology, Irvine Valley College, 5500 Irvine Center Drive, Irvine, CA 92618; ²Department of Psychology, Mesa College, 1833 West Southern, Mesa, AZ 85202; E-mail: jrudmann@ivc.edu).

This is a critical thinking teaching tip exchange session fueled by submissions in response to an e-mail survey. Pre-

senters will be given specific time limits and take turns in presenting their teaching tips and appropriate handouts.

Microscopy and Spectroscopy of Organic Functional Groups in Atmospheric Particles, **LYNN M. RUSSELL¹**, **STEFANIA GILARDONI¹**, **SATOSHI TAKAHAMA¹**, and **MARY K. GILLES²** (¹Scripps Institution of Oceanography, University of California at San Diego, La Jolla, CA 92093-0221; ²Chemical Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, CA 94720; E-mail: lmrussell@ucsd.edu).

Using several high resolution experimental techniques, including Scanning Transmission X-ray Microscopy (STXM) and Fourier Transform Infrared (FTIR) spectroscopy, we have investigated the organic composition of individual and submicron particles. Recent measurements of organic functional groups illustrate that the organic fraction of particles differs widely with region and altitude. More polar organic compounds tend to be more water soluble, increasing the hygroscopicity of aerosol particles. Differences in the organic composition of particles result from a combination of source variability and photochemical reactions. Particles measured in the Caribbean in July 2000 show more polar organic compounds in the free troposphere, consistent with photochemical aging of emissions transported from Central and Eastern Europe. Similar measurements of organic compounds in the Sea of Japan in April 2001 show more variability with altitude, consistent with the variety of that region's emissions. Measurements on the U.S. East Coast in July 2004 show consistent trends of increasing oxygenated organic groups with time and transport. Associated with these differences in organic composition are important changes in particle morphology, which may affect the reactivity of the air-particle interface.

What Is Work? **L. S. SCHULMAN** (Physics Department, Clarkson University, Potsdam, NY 13699-5820; E-mail: schulman@clarkson.edu).

The distinction between work and heat is essential to a statement of the second law of thermodynamics. But this distinction is based on the notions of macroscopic and microscopic which in turn depend on the definition of coarse grains (or on something equivalent). In practice there is a significant degree of subjectivity and technology dependence in that definition. Then how can the second law be fundamental? I will describe a way to define coarse grains that depends on time scales and is derivable in an objective way from the dynamics of the system. It relies on spectral properties of the time evolution operator. Although this approach was developed to address the fundamental question mentioned above, it has implications for the identification of communities in networks and for the representation of graphical data.

Using Quantum Mechanics to Resolve the Maxwell Demon Paradox, **MARLAN O. SCULLY** (Institute for Quantum Studies and Departments of Physics, Chemical and Electrical Engineering, Texas A&M University; Applied Physics Group, Mechanical and Aerospace Department and PRISM, Princeton University, Princeton, NJ 08544).

Szilard¹ made a decisive step toward solving the Maxwell demon problem by introducing and analyzing the single atom heat engine. Bennett² completed the solution by pointing out that there must be an entropy, $\Delta S = k \ln 2$, generated as the result of information erased on each cycle. Nevertheless, others have disagreed. For example, philosophers such as Popper “have found the literature surrounding Maxwell’s demon deeply problematic.”

We propose and analyze a new kind of single atom quantum heat engine which allows us to resolve the Maxwell demon paradox simply, and without invoking the notions of information or entropy. The energy source of the present quantum engine³ is a Stern–Gerlach apparatus acting as a demonesque heat sorter. An isothermal compressor acts as the entropy sink. In order to complete a thermodynamic cycle, an energy of $\Delta W = kT \ln 2$ must be expended. This energy is essentially a “reset” or “eraser” energy. Thus Bennett’s entropy $\Delta S = \Delta W/T$ emerges as a simple consequence of the quantum thermodynamics of our heat engine. It would seem that quantum mechanics contains the kernel of information entropy at its very core. That is the concept of information erasure as it appears in quantum mechanics⁴ and the present quantum heat engine have a deep common origin.

References

¹L. Szilard, *Zeitschrift für Physik*, 53 (1929) 840.

²C. Bennett, *Sci. Am.* 255 (1987) 107.

³M. Scully, *Phys. Rev. Lett.* 87 (2001) 22601.

⁴M. Scully and Drühl, *Phys. Rev. A* 25 (1982) 2208.

The Field Trip: Bringing It Home, **LESLIE SEIGER** (Biology Department, San Diego Mesa College, 7250 Mesa College Dr., San Diego CA 92111; E-mail: lseiger@sdccd.edu).

At San Diego Mesa College, an ecology and environmental science course is taught as a general education requirement for nonmajors, most of whom have little to no scientific background. With the great biodiversity and mild climate of southern California, local field trips are an integral component of this course. A field trip journal is assigned in order to increase active involvement on the part of the students, encourage outside learning, and further development of scientific knowledge as well as skills in observation and writing. This assignment is evaluated as a learning tool and its continuing evolution is discussed, as is the use of tools and techniques learned in FIRST workshops.

Back of the Envelope, **DANIEL P. SHEEHAN** (Department of Physics, University of San Diego, 5998 Alcalá Park, San Diego, CA 92110; E-mail: dsheehan@sandiego.edu).

The ability to make accurate order of magnitude physical

estimates—also known as “back of the envelope” calculations -- is one of the most prized skills among physicists and one of the most useful for any scientist or citizen. It allows science students to apply their knowledge directly to real world problems, integrate various domains of knowledge, use critical thinking skills, be creative in solutions and inquisitive in their outlook of the world. This talk will give an overview of how to employ “back of the envelope” calculations in science curricula.

Lagrangian Interpretation of Radin Markov-Chain Experiments, **DANIEL P. SHEEHAN** (Department of Physics, University of San Diego, 5998 Alcalá Park, San Diego, CA 92110; E-mail: dsheehan@sandiego.edu).

A recent series of experiments by Radin [1], involving intentioned observers interacting with quantum mechanically unstable systems (random number generators), indicate possible retrocausal influences. In this talk, Radin’s experimental results are interpreted within Lagrangian formalism, using a simple phenomenological model.

Reference

1) Radin, D., “Experiments testing models of mind-matter interaction,” in review, *J. Sci. Explor.* (2006).

Thermosynthetic Life, **DANIEL P. SHEEHAN** (Department of Physics, University of San Diego, 5998 Alcalá Park, San Diego, CA 92110; E-mail: dsheehan@sandiego.edu).

Two thermodynamic categories of life are currently recognized -- chemosynthetic and photosynthetic -- indicating their primary energy resource as either chemicals or electromagnetic radiation. Building on recent discoveries involving the second law of thermodynamics [1,2], we posit a third category of life -- thermosynthetic life -- which relies on environmental heat rather than on traditional free energy sources. Physical models for the conversion of heat into biochemical work are proposed. Conditions favorable to thermosynthetic life and prospects for its discovery are assessed. Deep-subsurface, unicellular superthermophiles are deduced to be likely TL candidates. Implications for the second law of thermodynamics are considered.

References

1) Capek, V. and D.P. Sheehan, *Challenges to the Second Law of Thermodynamics -- Theory and Experiment*, Vol. 146 *Fundamental Theories of Physics* (Springer, Dordrecht, Netherlands, 2005).

2) Sheehan, D.P., Editor, *First International Conference on Quantum Limits to the Second Law*, AIP Conference Proceedings, Vol. 643 (AIP Press, Melville, NY, 2002).

The Second Law and Experiments with Intrinsically-Biased Resonant Microcantilevers, **DANIEL P. SHEEHAN¹ and JEFFREY H. WRIGHT²** (¹Department of Physics, ²Department of Mathematics and Computer Science, University of San Diego, 5998 Alcalá Park, San Diego, CA 92110; E-mail: dsheehan@sandiego.edu).

A laboratory-testable challenge to the second law of thermodynamics has been proposed that utilizes the electro-

static potential energy of a standard semiconductor p-n diode junction to power a dc-driven NEMS-MEMS resonant cantilever oscillator [1]. This proposal has recently moved into the laboratory with experiments involving non-differentially-doped polysilicon prototypes fabricated within Sandia National Lab's SUMMIT V process. Experiments will test the dc-driven oscillator concept down to length scales two orders of magnitude smaller than have been previously demonstrated [2]. Analysis indicates that true second law challenge devices should reside at micron or near-submicron length scales and should operate at frequencies of 5-10MHz. Previously identified technical hurdles -- stiction and wear involving contacting cantilever surfaces -- now appear surmountable, using a novel surface structuring involving orthogonally-oriented arrays of carbon nanotubes [3]. The theory and current experimental status of the cantilevers and nanotube surface will be described in this talk, as well as plans for future experiments. Brief laboratory tours will be offered.

References

- 1) Sheehan, D.P., J.H. Wright, A.R. Putnam, and E.K. Perttu, *Physica E* 29, 87 (2005).
- 2) Bienstman, J., J. Vandewalle, and R. Puers, *Sensors and Actuators A* 66, 40 (1998).
- 3) Sheehan, D.P., "Orthogonally-oriented nanotube arrays: Theory," *J. Nanosci. Nanotech.*, in press, (2006).

The Impact of Disabling Illness on Creative Works in Later Life, **DEBRA J. SHEETS¹** and **PAMELA B. SCHMIDT²** (¹Department of Health Sciences, California State University, Northridge, Northridge, CA 91330-8285, E-mail: debra.sheets@csun.edu; ²Bunker Hill Community College, Boston, MA, 02129-2925, E-mail: pbschmidt@earthlink.net).

Artists, such as Beethoven, Matisse, Brahms, Monet, Haydn, Wagner, and Cervantes, continued to innovate and produce creative works in their advanced years despite infirmity or impairment. Health problems and changes in function can prompt a reflective attitude or problem-solving approach or stimulate new directions for artistic expression. For example, Matisse turned to cutting out paper designs when he could no longer stand at his easel; Georgia O'Keefe adapted to macular degeneration by doing pottery (instead of painting); and Winslow Homer taught himself to paint again after a major stroke. This paper examines the impact of disabling illness on well-known artists, writers and musicians of age who find ways to transcend and accommodate changes in their health and function through the creative process. It suggests that the humanities and arts provide a context for continuous self-invention that is inherently meaningful and contributes to lifelong learning.

Pseudoscience and the Importance of Common Sense, **PAUL SHIN** (Department of Chemistry and Biochemistry, California State University, 18111 Nordhoff St., Northridge, CA 91330; E-mail: alchemy@csun.edu).

The appalling lack of scientific literacy within our society is only part of the larger issue at hand. The misrepresenta-

tion or worse, the deceptive application of scientific information, can also be destructive as this can create an aversion to or outright fear of anything scientifically related. Therefore, Knowledge is not power- it's what you do with that knowledge, that's power! The negative impact pseudoscientifically based claims and products have on the perception of science in our society is explored. Can scientific education help to ameliorate this problem?

Physics without Causality: Theory and Evidence, **RICHARD SHOUP** and **THOMAS ETTER** (Boundary Institute, P.O. Box 3580, Los Altos, CA 94024; E-mail: shoup@boundary.org).

The principle of cause and effect is deeply rooted in human experience, so much so that it is routinely and tacitly assumed throughout science, even by physicists working in areas where time symmetry is well accepted, as it is in both classical and quantum mechanics. Experiments are said to cause their results, not the other way around. We argue that this assumption should be replaced with a more general notion of mutual influence -- bidirectional relations or constraints on joint values of two or more variables.

Experimental results suggesting retrocausality are seen frequently in well-controlled laboratory experiments in parapsychology and elsewhere, especially where a random element is included. Certain common characteristics of these experiments seem to contradict well-established physical laws, thus providing important clues that must be addressed by any explanatory theory. We discuss how retrocausal effects and other so-called "psi" phenomena can be explained without major injury to existing physical theory.

A new mathematical formalism known as Link Theory is introduced to show how the core laws of quantum mechanics emerge solely from abstract mathematical considerations, without reference to physical matter, particles, etc. Link Theory represents both classical and quantum states and behaviors using the same formalism but with different parameters, and can give new insights into the nature of randomness, quantum measurement, entanglement, and retrocausal phenomena.

At the Heart of Learning: How Art, Science, and Social Science are Woven into an Experience-based High School Program, **ROBERT SHUMER** (University of Minnesota, 170 Peters Hall, 1404 Gortner Avenue, St. Paul, MN 55108; E-mail: DRRDSMINN@msn.com).

Research on intelligence and learning suggests that art, social science, and science are all critical to the development of creative, intelligent, and wise individuals. All disciplines can stimulate imagination, and developing imagination is the goal of all education, according to Albert Einstein. Using a framework created by intelligence expert Robert Sternberg, this paper will explore the role that art and social science play in educational programs, especially in service-learning

initiatives. Using interactive methods, the paper will examine existing models of art/social science/science integration in educational programming. Development of the King/Drew Medical Magnet High School will serve as one of the focal points for the discussion. The evolution of this 24-year old initiative in South Central Los Angeles will highlight the opportunities available to educators in producing viable systems that integrate science with other disciplines to produce engaged, thoughtful students who can serve society in current and future times. The paper will discuss how art, science, and social science are woven into an experience-based high school program. Emphasis will be placed on how various disciplines can be combined to produce “wise” students.

Copper-Titania Catalysts for Environmental Protection, **A. SIMAKOV** (Department of Catalysis, CCMC-UNAM, Ensenada, 22800 B.C., México; E-mail: andrey@ccmc.unam.mx).

Copper-titania catalysts copper are effective in some catalytic reactions important for removal pollutants from the industrial exhaust gases. Different states of Cu(2+) ions have been found on the surface of supported copper-titanium oxide catalysts. The ratio between these states depends on the copper concentration and catalyst preparation method. Chain like copper species are formed due to the interaction of Cu(2+) ions with titania. Their concentration and geometry of their nearest oxygen environment are determined by the structure of anatase faces. Some of these surface-stabilized Cu(2+) ions are nucleation centers of oxide clusters. A noticeable growth of bulk CuO phase is observed after the completion of the formation of chain structures and oxide clusters. The investigation performed made it possible to make quantitative evaluation of the contents of different copper forms on the anatase surface and show that surface-stabilized chain forms of Cu(2+) ions are most active in the methane oxidation and NO selective catalytic reduction (SCR) with ammonia. In case of titania doped with chlorine the reduceability of copper species decreases as the increase of Cl/Cu ratio. It results in decrease of activity of Cu-Ti-O catalysts containing Cl anions in the reactions of SCR NO by ammonia and CH₄ oxidation. Introduction of sulphate anions supply us to improve both activity of Cu-Ti-O catalysts in SCR NO by ammonia and resistance of the catalysts to sulphur oxides.

Immunology and Memory, **ROBERT E. SIMON** (25851 Jamon Lane, Mission Viejo, CA 92691; E-mail: joandbob@cox.net).

The immune system and the brain have the capability of long term memory. Antibodies in response to antigen stimulation can be incredibly diverse yet specific. Memories of past events are specific to the stimulating experience. Both types of diversity require intact protein synthesis to occur. There is compelling circumstantial evidence leading one to theorize about homologous systems in the immune system and the brain involved in creating the diversity seen in im-

mune response and declaritive memory.

Some examples of immune nervous system convergence include memory and cognitive deficits in dysimmune diseases such as multiple sclerosis and systemic lupus. Corticosteroids used to treat inflammation are associated with faulty memory. Chemotherapy attacks tumors but affects the fast metabolizing immune system as well as causing “chemo brain.” Dietmar Schmuacher et al (1) has shown the extensive presence of Ig Superfamily isoforms in immunocytes and nervous system cells in insects.

Planned research will utilize cDNA chip technology that identifies mRNA that is a product of the generation of diversity known to occur in B cells. The new target mRNA will be from neurons and astrocytes. If mRNA that specifies Ig like molecules, and their pathway enzymes is identified in memory associated areas of cortex, we then will have evidence that unique proteins may be involved in unique long term memories.

References

- Watson, F. 2005. Extensive Diversity of Ig-Superfamily Proteins in the Immune System of Insects. *Science*. 209, 1874-1878.
Trautmann, A. 2001. Agrin- A Bridge Between the Nervous and Immune Systems. *Science*. 292, 1667-1668.

Physico-Chemical and Toxicological Characteristics of Ambient Ultrafine Particles, **CONSTANTINOS SIOUTAS** (Civil and Environmental Engineering, University of Southern California, 3620 S. Vermont Avenue, Los Angeles. CA 90089; E-mail: sioutas@usc.edu).

Emerging evidence on particle size and chemistry indicate that ultrafine particles < 0.1 μm (UFP) are important because compared with larger particles they have magnitudes higher particle number concentration and surface area, and larger concentrations of adsorbed or condensed toxic air pollutants per unit mass. Emission inventories suggest that motor vehicles are the primary direct emission sources of ultrafine particles in urban areas. Since the majority of particle numbers from vehicle exhaust are in the size range 20-130 nm for diesel engines and 20-60 nm for gasoline engines, it is important and necessary to quantify ultrafine particle emission levels, and to determine their behavior after emission as they are transported away from the emission source --- busy roads and freeways. The content of this presentation intends to serve as background material on what is known about the physical and chemical characteristics of particles in the proximity of roadways, including the volatile fraction of these particles as they leave the vehicle exhaust, a particularly important property, affecting the degree to which these particles decay with proximity to roadways as well as their physico-chemical changes as they infiltrate indoors. Results from our recent studies on the degree to which these particles penetrate in residences located in the immediate vicinity of roadways and the physical and chemical changes that occur during the outdoor-to-indoor infiltration processes will also be presented

Bulk Soil Erosion and its Potential Significance for Carbon Fluxes in a Mountainous Mediterranean—Climate Watershed, **S. V. SMITH¹, S. H. BULLOCK¹, A. HINOJOSACORONA¹, ERNESTO FRANCO-VIZCAÍNO¹, M. ESCOTO-RODRÍGUEZ¹, T.G. KRETZSCHMAR¹, L. M. FARFÁN², and J. M. SALAZAR-CESEÑA¹** (¹CICESE, Km 107 Carr. Tijuana-Ensenada C.P. 22860, Ensenada, Baja California, México; ²CICESE, Miraflores No. 334 e/ Mulegú y La Paz, 23050, La Paz, Baja California Sur, México; E-mail svsmith@cicese.mx).

Organic carbon (OC) balance in an ecosystem includes net ecosystem production (NEP, the difference between net primary production, NPP, and heterotrophic respiration, R_h), and lateral fluxes of OC that result as a consequence of erosion. This paper uses the RUSLE erosion model to estimate lateral fluxes of OC across a topographically complex coastal watershed in northwestern Baja California, and compares OC erosion to atmospheric CO_2 uptake and release. The watershed is dominated by natural to modified shrublands (69% of the area) and mixed agriculture (22%). Estimated bulk soil erosion averages about $1,350 \text{ t km}^{-2} \text{ yr}^{-1}$ (OC erosion is $\sim 8 \text{ t C km}^{-2} \text{ yr}^{-1}$). Slope is the primary control on spatial variation of erosion; about 80% of the area is erosional, while 20% is depositional. Bulk soil and soil OC move from erosional slopes to alluvial fans, altering OC storage and/or decomposition in the soil. Estimated erosion rates on shrublands are 50% higher than on agricultural lands. When examined by slope class, erosion appears to be more rapid in agricultural areas than in shrublands. For high-slope, high-erosion areas, erosional re-location of OC appears to be about $10 \text{ t km}^{-2} \text{ yr}^{-1}$, 5% of NPP ($\sim 220 \text{ t C km}^{-2} \text{ yr}^{-1}$). By contrast, NEP cannot be distinguished from 0. We conclude that relocation of OC plays a major role in spatial distribution and cycling of organic matter across the watershed.

Environmental Education for an Evolving Society, **JUAN-CARLOS SOLIS** (California Academy of Sciences, 875 Howard Street, San Francisco, CA 94103; E-mail: jcsolis@calacademy.org).

Natural history museums play an essential role in explaining biodiversity, and conservation to the public. Every year, natural history exhibits, and public education programs reach millions of people across the U.S. Museum visitors, and students, most of them families and school children living in urban areas, have little or no significant contact with the natural world. In addition, conservation education is nearly absent in school curricula, and most school teachers lack the resources to provide environmental education in the classroom. As a result, for the majority of people living in the U.S., a visit to a local natural history museum may provide one of the few opportunities to learn about biodiversity, and conservation. Along with the challenge of providing quality environmental education, natural history museums must make this information pertinent to a diverse audience. The

efficacy with which natural history museums explain biodiversity, and communicate environmental issues to the public will determine their role and relevance in the coming critical decades. In today's world, addressing the issue of relevance requires constant assessment of exhibits, and public programs designed to explain biodiversity and conservation. This discussion will focus in concepts under development for the new California Academy of Sciences.

Racial Diversification in Sulawesi Macaque Monkeys: Preliminary Results, **ROBERT R. STALLMANN** (Department of Anthropology, University of California, Davis, CA 95616, USA; E-mail: muh.alarabi@gmail.com).

The macaque monkeys of Sulawesi island, Indonesia, have diversified markedly in facial shape, fur color, and the size and shape of female sexual swellings. My study focuses upon two populations of Sulawesi booted macaques (*Macaca ochreata* subsp.) that were isolated from one another only about 12,000 years ago, and that have begun to diverge from one another in physical characteristics. The Sulawesi macaques lack major ecological differences in their habitats, diets, predation regimes, and feeding-related morphology.

Preliminary data suggest a lack of divergence between the populations in male body size and male canine size, traits that are likely to be under sexual selection but that are developmentally unidimensional. Meanwhile, traits that are developmentally multidimensional and possibly under sexual or social selection, and that may also function in species recognition (fur color, female sexual swellings, and to some extent, faces), seem to be diverging very rapidly. Thus the preliminary results suggest that trait dimensionality may be more important than the specific evolutionary process involved (e.g. sexual vs. natural selection) in determining how racial divergence proceeds among ecological generalists in the wild. These results are based upon a small and incomplete sample, however, and data on certain traits have not yet been analyzed quantitatively.

Intellectual Property Issues Facing Startup Companies, **SAM TAHMASSEBI** (Vista IP Law Group, LLP, 2040 Main Street, 9th Floor, Irvine, CA 92614; E-mail: skt@viplawgroup.com).

Two questions facing start-up companies while considering filing patent applications have traditionally been at what point in the development process should a patent application be filed and how much of the technology peripheral to the core technology should be included in the patent application. Traditionally, the answers have been as early as possible and as much as possible. However, recent decisions by the Court of Appeals for the Federal Circuit and rule changes proposed by the U.S. Patent and Trademark Office throw the merits of this strategy into question. The talk will cover the changing landscape and will provide alternative strategies for filing patent applications.

Large Eddy Simulation of a Stratified Benthic Ekman Layer, **JOHN R. TAYLOR and SUTANU SARKAR** (University of California, San Diego, Mechanical and Aerospace Engineering Building EBU-II, mail code 0411, 9500 Gilman Dr., La Jolla, CA 92037-0411; E-mail: j2taylor@ucsd.edu).

Large eddy simulation (LES) is used to study the turbulence and mixing in a stratified benthic Ekman layer over a flat seafloor. The density gradient is set to zero at the seafloor and is constant in the outer region which is also assumed to be in geostrophic balance. This choice of boundary conditions leads to a well-mixed, turbulent region near the lower wall with an outer stratified region populated by internal gravity waves generated by the boundary layer turbulence. We examine the effect of stratification on the boundary layer thickness and the Ekman spiral by varying the initial outer layer density gradient. While a steady-state density field is not attainable with the present choice of boundary conditions, the transient is examined by initializing with a constant density gradient throughout the domain. The growth of the mixed layer and rate of mixing in the turbulent boundary layer can then be considered since it occurs on much shorter timescales than the diffusive growth of the thermal boundary layer. Results of the present study are compared to simulations of the stable atmospheric boundary layer. In the atmospheric case, a stable stratification is present at the ground and near-wall turbulent production is affected by stratification. We find that for the oceanic case, the near-wall turbulence is relatively unaffected by stratification, but the entrainment across the boundary layer and the mean velocity and density profiles are strongly influenced by stratification.

Internal Wave Refraction Leading to Wave Breaking and Mixing in the Ocean, **JULIE C. VANDERHOFF, JAMES W. ROTTMAN, and KEIKO K. NOMURA** (Department of Mechanical and Aerospace Engineering, University of California, San Diego, La Jolla, CA 92093-0411; E-mail: jrocket@ucsd.edu).

The breaking of oceanic internal waves is an essential part of the deep-ocean mixing processes that contribute to the general circulation of the ocean, the exchange of heat and gases with the atmosphere, the distribution of nutrients and the dispersal of pollutants. The aim of this study is to improve our understanding of how these waves evolve toward breaking and the resultant mixing of momentum, heat, and materials in a realistic ocean environment. Specifically, ray and numerical simulations are used to examine the refraction of a short internal-wave packet by an inertia-wave packet to test the validity and explore the limitations of currently used models of the dissipation of short internal waves in the deep ocean. These so-called Doppler-spreading models for the high wavenumber end of oceanic internal wave spectra have been used with some success, but are far from well understood. They ignore a number of significant physical processes, especially time-dependent effects in their parametrization

of dissipation. The results of our simulations are enough to show that these ignored physical effects and in particular the time dependence in the long-wave shear can make a significant difference to short-wave behavior and should be taken into account in the models.

Physicists and Firewalkers: The Co-construction of Community Identity through Narratives in Ritual Performances, **JATILA VAN DER VEEN – DAVIS** (Gevirtz Graduate School of Education and Department of Physics University of California, Santa Barbara, Santa Barbara, CA).

Narratives often serve as a means of co-constructing the identities of both the speaker and listeners. Narratives can serve a homeostatic function by reinforcing a community's hierarchical (sometimes hegemonious) social structure, or they can serve a transformative, or possibly revolutionary function by presenting allegorical examples in which a social order is overthrown and a new order is established.

In physics conferences, the narratives most often told are of the type of "lone hero" story described by Johnstone (1993) as a "male narrative." The heroes are usually the narrator's thesis advisor, or one of the "icons" of the physics community, mostly male. Such stories can serve the unconscious purpose of maintaining the community sense of hierarchy or "cosmology."

The Nestinarstvo ritual in Bulgaria, which concludes with the walking on fire, is an example of an enacted narrative. Like the spoken hero-story narrative of physics, the Nestinarstvo ritual serves to strengthen the sense of community culture, but it is also an opportunity for transformation and change for the community as a whole.

The usefulness for physicists, and particularly for physics educators, in examining the power of narratives is to understand the psychological role that our "hero stories" play in shaping students' attitudes towards themselves as potential members of the science community.

Establishment of Oriental Fruit Fly (Diptera: Tephritidae) and Fopius arisanus (Sonan) (Hymenoptera: Braconidae) in French Polynesia, **ROGER I. VARGAS¹, LUC LEBLANC² and RUDOLPH PUTOA³** (¹U. S. Pacific Basin Agricultural Research Center, USDA-ARS, POB 4459, Hilo, HI 96720, E-Mail: rvargas@pbarc.ars.usda.gov; ²Dept. of Plant and Environmental Protection Sciences, University of Hawaii, 3050 Maile Way, Honolulu, HI 96822; ³Le Service du Developement Rural, BP 100, 98713 Papeete, Tahiti, FP).

Oriental fruit fly, *Bactrocera dorsalis* (Hendel), a severe economic pest of tree fruits, was discovered in French Polynesia on Tahiti Island in July 1996, where it had been accidentally introduced from Hawaii. Large-scale eradication programs were conducted from 1997 to 2001, but failed. During surveys from 1998 to 2002 *B. dorsalis* was recovered from the five Society Islands of Tahiti, Moorea, Raiatea, Faha, and Huahine. Analysis of fruit infestation by *B. dor-*

salis, and two other fruit fly species, Queensland fruit fly, *Bactrocera tryoni* (Froggatt), and *Bactrocera kirki* (Froggatt), suggested *B. dorsalis* had displaced the other fruit fly species and is now the most abundant species. To suppress *B. dorsalis*, a biological control program was developed between the USA and French Polynesia to introduce the major *B. dorsalis* natural enemy from Hawaii, *Fopius arisanus* (Sonan). Ten shipments (>500,000 wasps) of *F. arisanus* were made between 2002 and 2004 from Hawaii. Wasps were released and established on Tahiti, Moorea, Raiatea, Fahaa, and Huahine Islands. In subsequent surveys on Tahiti Island, *F. arisanus* has been recovered in 21 of the 21 districts. In a typical rural area, *B. dorsalis* parasitism was as high as 50%. Establishment of *F. arisanus* is the most successful example of classical biological control of fruit flies in the Pacific area outside of Hawaii and serves as a model for releases and suppression in other parts of the world (i.e. South America and Africa) where *B. dorsalis* has also become established.

Computational Analysis of Grainyhead-like Epithelial Transactivator (Get-1) Regulated Genes, **MADHVI VENKATESH¹**, **AMBICA BHANDARI²**, and **BOGI ANDERSEN²** (¹University High School, Irvine, CA, 92612; ²University of California, Department of Biological Chemistry, Irvine, CA, 92697; E-mail: vidyavenkatesh@gmail.com).

Grainyhead-like epithelial transactivator (Get-1/Grhl3) is a conserved mammalian homolog of Grainyhead, the protein which plays an important role in the cuticle development in *Drosophila*. It has been shown that Get-1 plays a critical role in the terminal differentiation of the skin epidermis and is essential for barrier function in mice. Microarray gene expression analysis of Get-1 knockout mice indicates that it regulates a broad array of epidermal differentiation genes encoding structural proteins, lipid metabolizing enzymes and cell adhesion molecules. In order to identify the direct target genes of Get-1, we looked for potential Get-1 sites conserved between upstream, downstream and intronic regions of mouse and human genes using the ConSite program. We considered only those sites that were also present in significantly conserved regions. We analyzed the top forty significantly differentially expressed genes from the microarray data. Get-1 binding sites were found in eight upregulated and sixteen downregulated genes, indicating that Get-1 directly regulates some genes involved in epidermal differentiation. The fact that both up and downregulated genes contain Get-1 binding sites suggests that Get-1 can both activate and repress transcription.

The Relationship between Civically Engaged Pacoima Residents and the Utilization of Dental Services, **MONICA VILLALVAZO**, **OCTAVIA ASKEW**, **HECTOR GODOY**, and **BEN FREED** (Post Baccalaureate Program, School of Dentistry, University of California, Los Angeles, Center of Health Sciences, Los Angeles, CA 90005-1688; E-mail: mxv1111@

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Nearly 67 million people of Hispanic origin will be added to the nation's population by 2050^c. With this increase, there are public health concerns regarding the use of health services. Previously, the Andersen behavioral model was employed to predict and explain people's use of health services^b. Although, the model was criticized for minimizing the impact of culture and social networks, these relationships can serve to facilitate or impede health services^{b,d}. This study investigates the association between the degrees of civic engagement of residents, along with other commonly used variables and the utilization of dental services.

The study took place in Pacoima, a Los Angeles City neighborhood of about 98,000 people of which 86% are of Latino origin. About one in three adult residents are immigrants or first generation residents and live in the most economically disadvantaged area of the San Fernando Valley^f.

The cross sectional study used data collected in 2004, from the Community Engagement Process and included over 800 household interviews. Multivariate analyses show a significant relationship between increased civic engagement and higher utilization of dental services even when traditional predisposing and enabling factors are considered. This study reemphasizes the importance of social and cultural interactions which should be accounted for in creating and implementing public policy to enhance future human health services.

References

- ^aK A Phillips, K R Morrison, R Andersen, and L A Aday. 1998. "The context of healthcare utilization: assessing environmental and provider-related variables in the behavioral model of utilization" *Health Service Res.* August; 33(3 Pt 1): 571-596.
- ^bR.M. Andersen.1995. "Revisiting the Behavioral Model and Access to Medical Care: Does it Matter?" *Journal of Health and Social Behavior.* Vol. 36. March 1-10.
- ^cCensus Bureau, March 18, 2004
- ^dBass, David M. and Lina S. Noelker. 1987. "The Influence of Family Caregivers on the Elder's Use of In-Home Services: An Expanded Conceptual Framework." *Journal of Health and Social Behavior* 28:184-96
- ^eMittelmark MB, Hunt MK, Heath GW, Schmid TL. 1993. "Realistic outcomes: lessons from community-based research and demonstration programs for the prevention of cardiovascular diseases". *Journal of Public Health Policy.* Winter;14 (4):437-62.
- ^fMarvin Marcus, Carl A. Maida, Norma Guzmán-Becerra, Roberto Bellosa & Linda Difell. Policy Implications of Access to Dental Care for Immigrant Communities, California Policy Research Center, Berkeley, 2001

Is Secondary Organic Aerosol Formation from Anthropogenic Pollution Controlled by Physical or Chemical Processes? **RAINER VOLKAMER** (University of California - San Diego, Department of Chemistry and Biochemistry, 9500 Gilman Drive, MC 0356, La Jolla, CA 92093-0356; E-mail: rainer@ucsd.edu).

Anthropogenic VOCs (AVOCs) are deemed responsible for about 10% of the global SOA burden, while the bulk 90% is believed of biogenic origin. The contribution from AVOCs is in fact deemed that small, that AVOCs have in some cases

even been fully neglected in global assessments of the direct climate forcing of SOA (i.e. cooling).

The partitioning of very volatile carbonyls, like glyoxal (CHOCHO), to aerosols is recently gaining interest, though the atmospheric relevance of reactive uptake of volatile carbonyls to ambient aerosols is presently not clear, and the reaction pathways in aerosols remain speculative. SOA mass from glyoxal varies by three orders of magnitude depending on whether the uptake of glyoxal to aerosols is reversible or irreversible.

This talk reviews our understanding of gas-phase sources for glyoxal and presents first direct observations of glyoxal on local and global scales that have recently become possible by Differential Optical Absorption Spectroscopy. Data from the MCMA-2003 field campaign in Mexico City is presented that firmly link a large missing SOA source to first generation AVOC oxidation products in the polluted urban atmosphere. Based on these results AVOC could be responsible for up to 40% of the global SOA burden. The question is discussed whether SOA formation in the polluted urban atmosphere is controlled by physical or chemical processes.

Self-organization of Temporal Structures - A Possible Solution for the Intervention Problem, **WALTER VON LUCADOU** (WGFP, Hildastrasse 64, D-79102 Freiburg, Germany; E-mail: lucadou@freenet.de).

The model of generalized quantum theory (WQT) provides a model of retrocausation. It is considered as entanglement correlations in psychophysical systems, which are induced by the “organizational closure” of the system and its pragmatic information. From this point of view retrocausation-experiments reveal temporal structures, which contain temporal entanglement correlations and thus demonstrate the self-organization of the system.

From the principle, that entanglement correlation cannot be used for transmitting signals, on one hand, intervention paradoxes can be avoided, but on the other hand, decline and displacement effects are expected. This limits repeatability of such experiments in an unfortunate way. A certain experimental technique, however, avoids this problem:

The paper presents such an experiment. It is a conceptual replication of two earlier experiments, which demonstrate entanglement correlations between a quantum physical random process, and certain psychological variables of human observers.

With the present study temporal correlations were investigated. Button-pushes were used as psychological variables. The button-pushes that were administered by the subject in order to “control” an independent random process that could be observed on a display.

The results corroborate previous studies. The specific way in which the subjects pushed the buttons is highly significantly correlated with the independent random process. This correlation shows up for the momentarily generated

random events as well as for the previous and the later runs during the experimental session.

These results are in agreement with the predictions of WQT. The entanglement-correlations cannot be considered as a causal influence but as a case of retrocausation.

Metal-Polymer and Metal-Ceramic Colloidal Building Blocks for 3D Photonic Crystals, **ISA D. WATSON¹, IAN HOSEIN², STEPHANIE LEE², and C.M. LIDDELL²** (¹Department of Chemistry, Hampton University, Hampton, VA 23668; ²Department of Materials Science and Engineering, 128 Bard Hall, Cornell University, Ithaca, NY 14853; E-mail: iw28@cornell.edu, isa.Watson@pipeline.hamptonu.edu).

Photonic Crystals produce an imperative technological advantage over conventional electronic technologies. Crystals possessing a photonic band gap behave like semiconductors for light, offering the possibility that they may be manipulated in ways similar to electrons. We report the synthesis, coating and assembly of sub micron colloids, coated with silver nanoparticles. The colloids were coated by means of two methods: the Physical Embedding Method and the Layer-by-Layer (LbL) method. The Physical Embedding Method aims to co-condense the colloidal shell with metal nanoparticles that adsorb on the surface. The LbL Method involves the sequential adsorption of oppositely charged polyelectrolytes in which ZnS colloids are coated with a positive polyelectrolyte, (PDADMAC) then negatively charged metal nanoparticles followed by another coating of PDADMAC and a final coating of a negative polyelectrolyte, (PSS). Energy Dispersive X-Ray Spectroscopy, a Scanning Electron Microscope and a Zeta Sizer were used to analyze and characterize the coated colloidal particles. The results reveal that a chemical modification needs to be applied to the Layer Embedding reaction and that the LbL Method using ZnS colloids and Ag nanoparticles was successful.

Trophic Structure and Ecological Recovery of Venice Lagoon Restored and Natural Salt Marshes: A Stable Isotope Approach, **C. WHITCRAFT, L. LEVIN, P. MCMILLAN, G. MENDOZA, and J. GONZALEZ** (Scripps Institution of Oceanography, La Jolla, CA, 92037; E-mail: cwhitcra@ucsd.edu).

Habitat degradation and rising water levels are challenging the integrity of Venice Lagoon’s habitats. Salt marsh restoration has been conducted extensively within the lagoon in order to reclaim lost wetlands. One criterion for successful marsh recovery is the establishment of natural trophic functions. To examine food web structure, we sampled two natural marshes, a 3-year old and an 8-year old restored marsh in northern and central Venice Lagoon. Three successional habitats were sampled in most marshes: pond (low elevation), *Salicornia/Spartina/Limonium*-vegetated sediments (mid elevation) and *Sarcocornia*-vegetated sediments (upper elevation). The ¹³C and ¹⁵N signatures of plants, macroalgae,

microalgae, sediment organic matter (SOM), and suspended particulate organic matter (POM) were examined to assess the primary producer base (food sources). Infaunal and epifaunal invertebrates were collected from each marsh and habitat, and their isotopic composition analyzed to determine their primary food sources and the numbers of trophic levels present in the marsh food web. Based on isotope data and mixing models, micro- and macro-algae appeared to be the primary food source of the majority of consumers examined. Natural marshes (Scanello, San Felice-Gaggian) and the 8-yr old marsh (Ravaggio) exhibited distinct algal signatures in each successional environment with parallel trends among consumer invertebrates. We observed lighter ^{13}C and sometimes heavier ^{15}N with increasing elevation, indicating a possible gradient of decreasing cyanobacterial contribution and increasing plant contribution with successional algae. The youngest marsh (Palude Burano Sud) did not exhibit distinctive isotope signatures among producer or consumer in the pond versus *Salicornia* habitats, suggesting system immaturity. Venice Lagoon marsh trophic structure is similar to that observed in marshes of southern California, where the climate is also Mediterranean.

This work is a component of the "SIOSED" project, a part of a comprehensive effort to support the integrated management of Venice Lagoon sediments and ecosystems promoted by the Venice Water Authority through its Concessionary, Consorzio Venezia Nuova.

Introduction to and Overview of Project FIRST (Faculty Institutes for Reforming Science Teaching), **KATHY S. WILLIAMS** (Department of Biology, San Diego State University, San Diego, California 92182-4614; E-mail: kwilliams@sunstroke.sdsu.edu).

Project FIRST II (Faculty Institutes for Reforming Science Teaching) is an NSF funded faculty development program designed to help college biology faculty improve their teaching and student learning. With major nodes at biological field stations and marine laboratories, teams of scientists collaborate in a supportive environment to work towards integrating teaching and learning into their professional culture. The FIRST II project includes over 170 faculty from 46 field stations, community colleges, liberal arts colleges, and research universities across the US. Working together in large and small groups, faculty design student-active instructional strategies and assessment techniques to improve learning by all students. FIRST II has a node based at San Diego State University, with faculty teams working together at several colleges in the area to improve learning by all students. By using various tools, such as concept mapping, using concept questions and wireless response systems, collecting real-time data and analyzing it, and employing embedded assessment of various types, faculty are collecting data to inform their teaching and enhance student learning and retention. This symposium presents some of these strategies and demonstrates how faculty can design classroom activities and collect data about teaching and learning in different courses.

Creating Value Through Structure-Based Drug Discovery, **KEITH WILSON** (Takeda San Diego, 10410 Science Center Drive, San Diego, CA 92121; E-mail: KeithWilson@takedasd.com).

Syrrx was founded six years ago at the height of the 'biotech bubble' with the vision of building a world class structure-based drug discovery company. Cutting edge technologies were coupled with experienced talent and a practical target selection philosophy to deliver on this vision. Despite serious financial challenges after the bubble burst, Syrrx succeeded in progressing from gene to phase II start on its first drug discovery program in less than 37 months (more than twice as fast as the industry average rate for accomplishing this goal). Syrrx weighed various exit options, and ultimately decided to be acquired by Takeda Pharmaceuticals in 2005 for \$270MM in a friendly acquisition. This was the first acquisition in the >200 year history of Takeda. Takeda San Diego (formerly Syrrx) is now Takeda's global center for excellence in structure-based drug discovery, and is growing rapidly in response to Takeda's strategic needs. This case study will be used to educate attendees on the challenges and opportunities for creating value for investors, employees, and patients in the current biotech environment.

Saliva Diagnostics: Powered by NanoTechnologies, Proteomics and Genomics, **DAVID WONG** (Associate Dean of Research, School of Dentistry; Professor, Division of Oral Biology & Medicine; Director, Dental Research Institute, University of California, Los Angeles, 10833 Le Conte Avenue, 73-017 CHS, Los Angeles CA 90095; E-mail: dtww@ucla.edu).

A transformation is currently in place whereby we are witnessing increasing awareness, scientific research and clinical utility of saliva as a diagnostic fluid. Much of this is due to the timely investment by the National Institute of Dental & Craniofacial Research to develop technologies and diagnostic targets for saliva diagnostics. Nanotechnology-based saliva biosensors that are point of care, automated and self-contained which can be used as clinical chair side devices are currently being developed. In addition, diagnostic targets in saliva are concurrently being deciphered based on the salivary proteome. The convergence of diagnostic technologies and the salivary proteome will present clinical platforms and diagnostic targets that will have enormous translational and clinical utilities.

Sea Semester: An Interdisciplinary Study Abroad Program with Transferable Elements for Effective Student Engagement, **A. MICHELLE WOOD** (Sea Education Association, Woods Hole, MA, and Center for Ecology and Evolutionary Biology, University of Oregon, Eugene, Oregon, 97403; E-mail: m.michellewood@gmail.com).

When a student approaches a Study Abroad office, they rarely suggest "The Atlantic Ocean" or "The South Pacific" as their intended travel destination. However, the ocean land-

scape covers 71% of the planet and is extremely difficult to visit. Nonetheless, the 12 week program offered to undergraduates by the Sea Education Association (www.sea.edu) in Woods Hole, Massachusetts, provides undergraduates a chance to meet essentially all goals of their study abroad experience while obtaining an intimate knowledge of the sea and seafaring tradition. The program is well-known for its rigorous curriculum and the team-focused environment of the shipboard experience. By the end of the six-week sea component, students are competent junior watch officers, handling the 135' brigantine schooners and making decisions about sail plan, course, and timing of scientific sampling. Exposure to other cultures in the Caribbean, North Atlantic, North Pacific, and the islands of the South Pacific occurs through port stops on each ~3000 mile voyage, and students also experience the unique culture of the working seaman. While travel, personal challenge, maritime study, and exposure to state-of-the-art oceanographic research are at the heart of each Sea Semester, the program has many basic elements that can be tapped for interdisciplinary shore-based programs at any undergraduate institution. In this talk, I discuss elements of the SEA program that would be critical to the success of the pedagogical model in any setting: motivation of students and faculty, program design, student ownership of the program, and student accountability for the program.

Schooner Science: New-fangled Plankton Research on Tall Ships, **A. MICHELLE WOOD**^{1,2}, **KARA LAVENDER**², and **ERIC ZETTLER**² (¹Center for Ecology and Evolutionary Biology, University of Oregon, Eugene, Oregon, 97403, E-mail: m.michellewood@gmail.com; ²Sea Education Association, Woods Hole, MA, 02543, E-mail: klavender@sea.edu, ezettler@sea.edu).

From the HMS *Challenger* to the R/V *Atlantis*, sailing vessels have been central to the birth of oceanographic research. As participants in the 12-week Sea Semester program of the Sea Education Association, undergraduate students have an opportunity to participate in this great adventure. During a six week intensive period of interdisciplinary shore-based study that covers maritime history, maritime culture for regions on the cruise track, oceanography, and nautical science (e.g. celestial navigation, piloting, sail trim), students also develop research projects that utilize state-of-the-art research tools to study the organisms, chemistry, and currents of the open ocean and its benthic environment. These projects are then conducted during a six-week sea component aboard the traditional sailing vessels SSV *Corwith Cramer* and SSV *Robert C. Seamans* operated by SEA in the Atlantic and Pacific. Here, we report the results of recent student-conducted studies on plankton physiology, biogeography, and grazing. As stand-alone projects, these studies allow students to explore the challenges of developing and executing research plan that can be tested at sea. In the context of the overall SEA program, which has as much as a thirty-year his-

tory of sampling the same open ocean regions with different student groups, the projects contribute to an extensive data base of use to the broader scientific community.

Determination of E. coli Levels and Sources of Fecal Contamination in Strawberry Creek, **TANNER Y.W. ZANE**, and **PAMELA Z.F. HAN** (Environmental Sciences Teaching Program, Department of Earth and Planetary Science, McCone Hall, University of California, Berkeley, CA; E-mail: tzane@cal.berkeley.edu).

Strawberry Creek is part of a highly urbanized watershed that includes the UC Berkeley campus. Water quality is known to be influenced by runoff containing hydrocarbons, fertilizers, pesticides, and organic matter. Little is known, however, about the contribution of homeless encampments, domestic pets, and area wildlife on fecal contamination levels in the watershed. This study examined levels of *E. coli*, a commonly used fecal contamination indicator, at eight sampling locations along the creek to determine if fecal matter was a pollutant. Sampling and analysis occurred over eight months between August 2005 to March 2006 on a bi-weekly basis, using the EPA-approved IDEXX Colilert method. *E. coli* counts exceeded the safety limit of 2000 MPN/100ml established by the San Francisco Regional Water Quality Control Board on at least one occasion for each testing site. *E. coli* counts were particularly high after rain events. From these findings, we surmised the elevated *E. coli* level to be from broken sewer lines or homeless encampments. To test our hypothesis, samples from sites with the highest *E. coli* levels were sent to Source Molecular Corporation to determine the presence of two indicator organisms—human *Enterococcus* and *Bacteroidetes*. Results were below the detection limit for human contamination, but strongly suggest other animal sources. Determination of which animals—domestic pets or area wildlife—contribute the most to the *E. coli* load will require more detailed analysis such as DNA fingerprinting analysis using ribotyping.

Physical Setting and Physical Forcing of the Venice Lagoon, **ALBERTO ZIRINO** (Scripps Institution of Oceanography, MC 02020, La Jolla, CA, 92037 USA; Consorzio Venezia Nuova, 30124 Venezia, Italy; University of San Diego, San Diego, CA, 92110, USA).

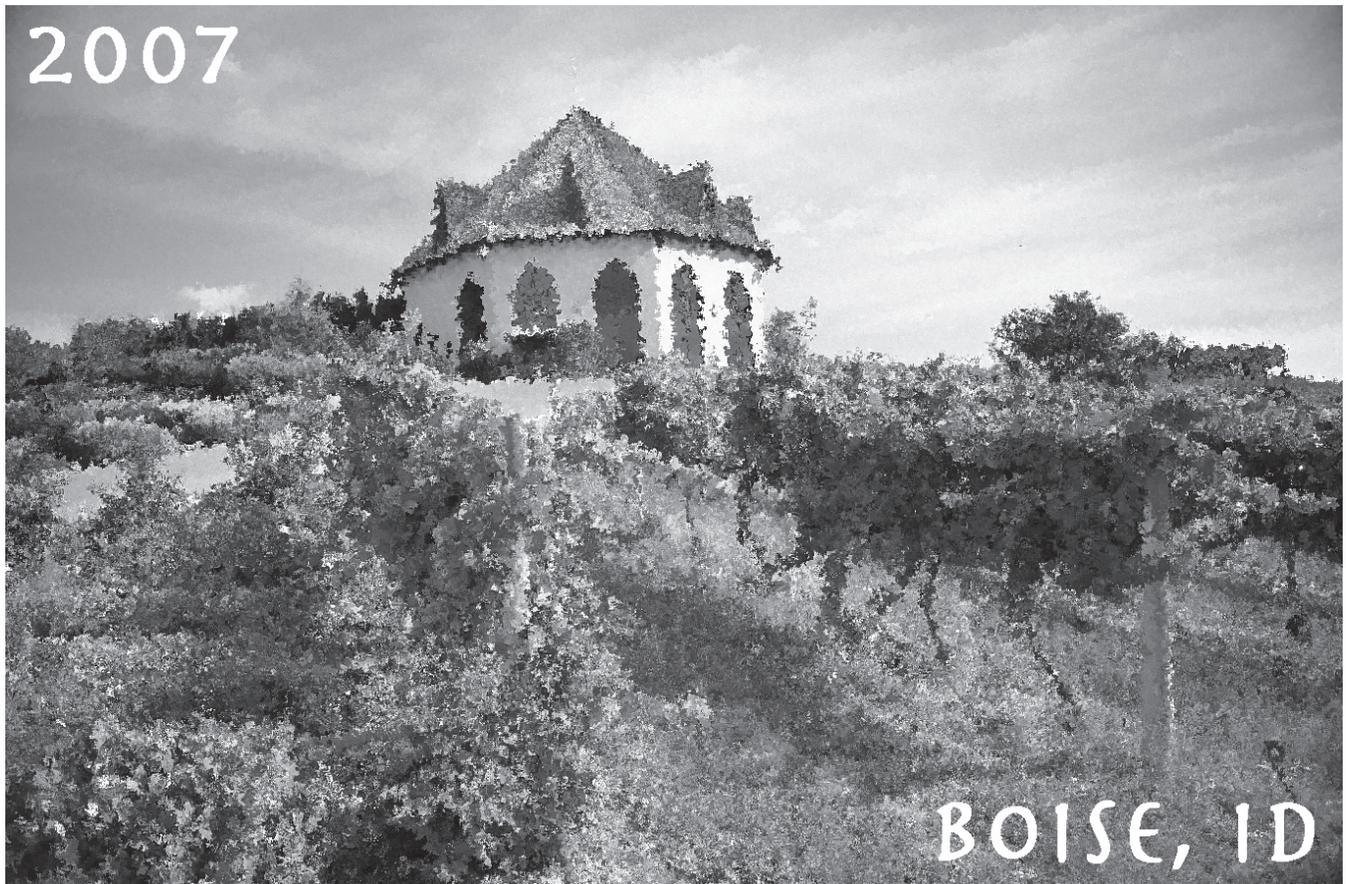
The Venice Lagoon is extremely shallow for its area. If we assume a square lagoon, its area to depth ratio would be 23,000 to 1, much thinner than an ordinary sheet of paper. This alone, suggests that exchanges occurring at the lagoon floor as well as airborne inputs will be important in any budgetary calculations of its chemical constituents. Because of its shallowness, the lagoon is well flushed and well mixed vertically, by both bottom friction and wind action. Hydrodynamic residence times vary from 1-3 days near the entrances to 20-30 days in the least flushed sectors adjoining the mainland. The lagoon floor is etched with many ca-

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nals, the main ones, leading from each of the entrances to the mainland, are quite deep (ca. 20 m) and wide enough to accommodate supertankers and largest ocean liners. It is estimated that approximately 50 percent of the water flow in and out of the lagoon goes via the canals. Throughout the lagoon, there are extensive mud flats that become exposed at low tide. Average tidal range is approximately +/- 35 cm, with large excursions occurring under seasonal Bora (NE) or Scirocco (S-SW) wind conditions. Freshwater input into the lagoon occurs year round and is greatest during winter and spring. Due to the historical diversion of much of the river inflow around the lagoon, the average freshwater input rate is only about 2 percent of the input rate of Gulf of Venice water

(200 m³/s. vs. 10,000 m³/s).

The diversion of the major rivers in the 1700's served to reduce the availability of sediment to the lagoon. This has led to the present state where (apparently) more sediment is lost to the Adriatic than is being replaced by river input and organic production. There is also a shifting of sediment that is occurring from the illegal clam fishing and the action of the residual currents. As expected, these shifts are also dependent on meteorological conditions and lagoon morphology. The inexorable action of the tides and the resulting residual currents along with the major storm events have led to a continuing "loss of definition" (flattening) of the lagoon bathymetry.



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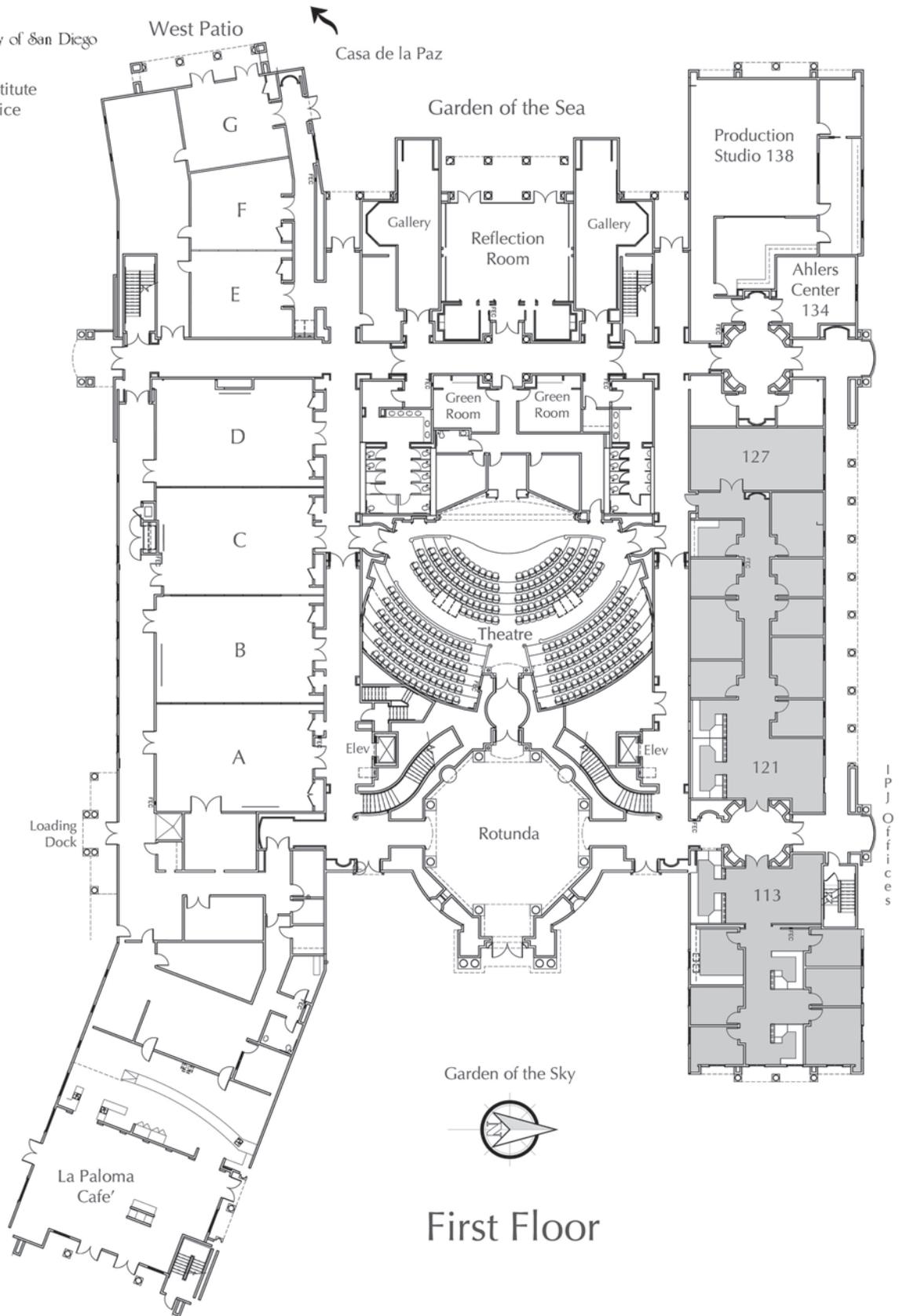
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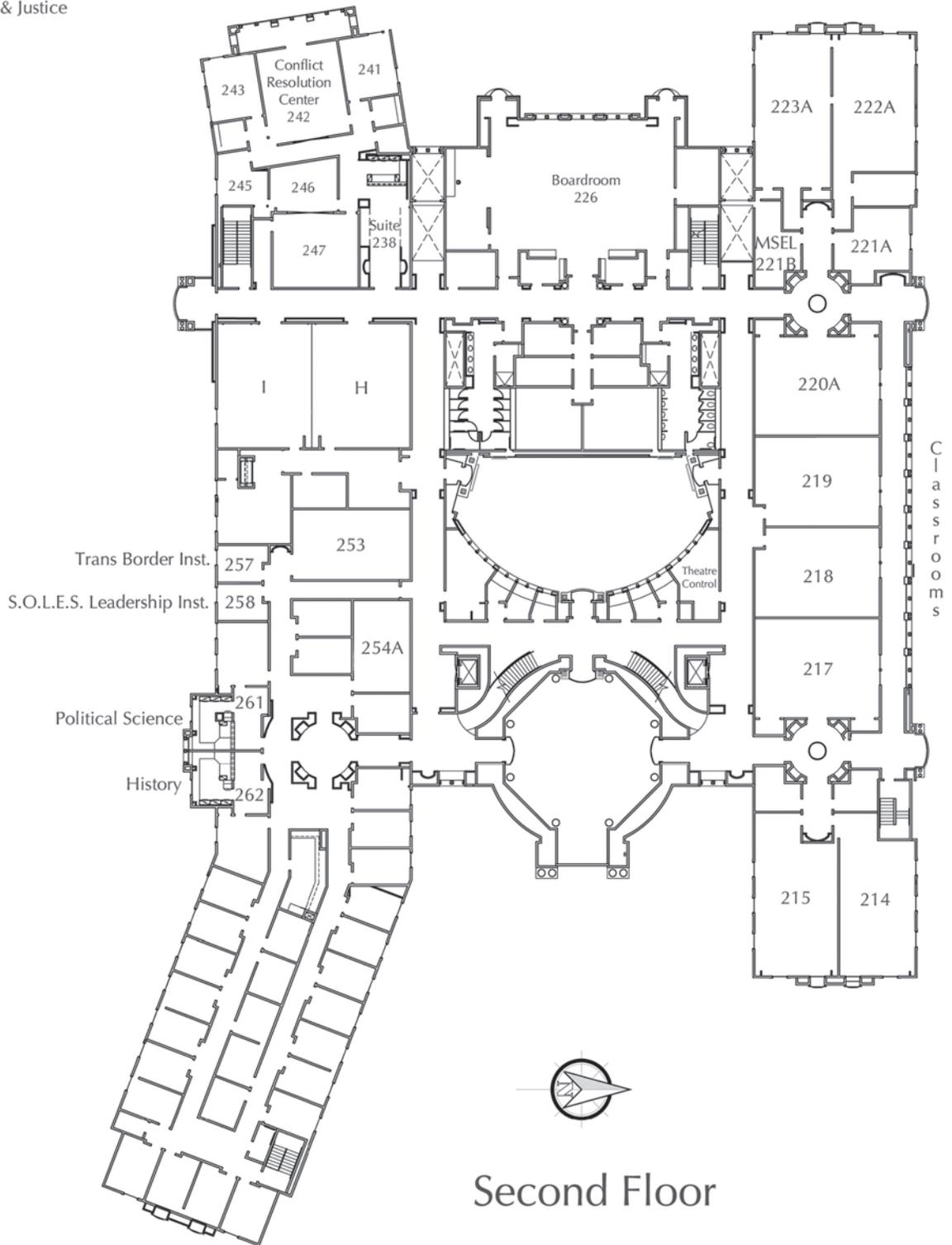
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