PROCEEDINGS of the PACIFIC DIVISION
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86th ANNUAL MEETING of the AAAS PACIFIC DIVISION

PROGRAM WITH ABSTRACTS

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86th ANNUAL MEETING of the AAAS, PACIFIC DIVISION and ITS AFFILIATED SOCIETIES and SECTIONS SOUTHERN OREGON UNIVERSITY ASHLAND, OR June 12 - 16, 2005

GENERAL INFORMATION

ORGANIZATIONS, SOCIETIES, and SECTIONS SPONSORING SESSIONS at the ANNUAL MEETING

The following societies and Pacific Division sections are sponsoring sessions at the 86th Annual Meeting of the AAAS Pacific Division.

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

SOUTHERN OREGON UNIVERSITY and VICINITY

Southern Oregon University (SOU) is a contemporary public liberal arts and sciences university with selected professional programs at the bachelor's and master's levels. It is one of seven universities in the Oregon University System (OUS). Its purpose is to provide intellectual and personal growth through quality education. Southern emphasizes critical thinking, career preparation, and capacity to live and lead in a multicultural, global society. The University has a student-to-faculty ratio of 19:1, and 93 percent of faculty teaching classes have the highest degrees in their fields.

SOU serves the whole of southern Oregon and the northernmost counties of California. The University is a major partner in the economic, cultural, and environmental developments of this vast area, offering students valuable

opportunities to participate. SOU's rising national reputation is based on its faculty's notable research and creative talents, as well as its practical liberal learning. Southern is one of twenty-one institutions across the nation selected for membership in the Council of Public Liberal Arts Colleges (COPLAC). It is engaged internationally through a strong proportion of students from other nations, many exchange programs, and longstanding sister university alliances, the flagship being the Universidad de Guanajuato, Mexico.

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

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

SOU Photographic Services

THE REGION

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

Art and culture, recreation, tourism, retail sales, natural resources, and the burgeoning healthcare services are the driving forces of the region's economy. Technology industries are diversifying the economy as new companies move into the area, start-up firms emerge, and technology advances locally. There are three medical centers that offer world-class healthcare services.

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

ASHLAND and SOU

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

Ashland is surrounded by forests, mountains, lakes, and rivers that provide spectacular areas for outdoor sports and ecological studies. With an average rainfall of twenty inches, Ashland benefits from a mild four season climate. Although the valley floor is generally free of snow, winter recreational facilities are just a thirty minute drive away at Mount Ashland

Ski and Snowboard Resort, which sits at 7,500 feet elevation. Just minutes away, Emigrant Lake offers waterslides, sailing, and a park. Several mountain lakes are within an hour or less drive from Ashland.

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

ASHLAND CAMPUS

Southern occupies a 175 acre campus with fourteen academic buildings, thirteen residence halls, family housing, a student union, and multiuse facilities. All classrooms on campus are accessible to disabled students. Beautifully landscaped grounds and architecturally pleasing buildings provide a pleasant environment for academic endeavors, student club activities, and opportunities to think and study together with peers and faculty. SOU is nearing completion of a major renovation and expansion of its Hannon Library. The project has nearly doubled the size of the library and yielded a new learning center with contemporary services and technologies, ample study spaces, seminar rooms, reading areas with fireplaces, and a coffee shop.

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

SOU STATISTICS

In the 2003/2004 academic year, SOU boasted a total enrollment of 5,478 students. Of these, 3,955 were undergraduates and 561 were graduate students. The average age of students was 25. Seventy-nine percent of students came from Oregon while 150 came from 30 different countries. Ten percent of the student body identify themselves as members of ethnic minorities. In 2003/2004, 1,202 degrees and certificates were awarded. Of these, 66% were for Bachelor's degrees and 22% were for Master's degrees.

REGISTRATION

The Registration Center is in the foyer of the Sciences Building on the Southern Oregon University Campus. Hours for registration are:
Sunday, 2:00 – 5:30 p.m.
Monday, 7:30 a.m. – 5:00 p.m.
Tuesday, 7:30 a.m. – 5:00 p.m.
Wednesday, 8:00 a.m. – 3:00 p.m.

Those who preregistered may pick up their packets at the Registration Center. Packets contain a copy of the Division's Proceedings (Vol. 24, Part 1: Program with Abstracts), name badges, special events tickets, maps and brochures. On-site registrants will receive registration materials on payment of the appropriate fees.

The fees for registration are Professional, $80; Teachers K – 14, $60; Students, $40; Retired and Emeritus, $60; Participating Spouse, $40; One-day, $60; Bio-Rad Workshops Only, $20.

About field trips: Advance registration is required for all field trips because of limited seating in the vehicles and the need to inform some destinations of numbers of people arriving. If you are interested in one or more of the field 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 field trip reservations must be a paid meeting registrant.

About tickets to attend performances by the Oregon Shakespeare Festival (OSF): A limited number of tickets were available for meeting registrants to purchase to attend performances of the Oregon Shakespeare Festival. If you are interested in attending one of the plays and didn't purchase tickets in advance, ask at the Registration Desk to see if any tickets are available. At least one member of a family group requesting play tickets must be a paid meeting registrant.

ACCOMMODATIONS and FOOD SERVICE

Residence Halls: Housing is available in Southern Oregon University residence halls for $22.50 per person per night double or $36.50 per person per night single. For those wishing to partake of an all-you-can-eat breakfast in the dining commons each morning, the cost for room and breakfast is $29.00 per person per night double or $43.00 per person per night single.

Cox Hall, the university residence hall to which our group is assigned, was recently remodeled. It consists of typical dorm rooms with shared bathrooms down the hall. Rooms can ac-

commodate a maximum of two persons. For your comfort, rooms are air conditioned. Rooms are furnished with two twin beds, desk with lamp and chair, bureau and closet. On arrival, rooms are made up with linens, a blanket, towels, plastic cups, and small bars of soap. On the fourth day of a stay, fresh towels are provided. On the seventh day of a stay, fresh linens and towels are provided. Maid service is not provided. Ice machines, extra pillows, and extra blankets are not available. Guests who bring extra towels should pack colored ones, as the ones provided are white. Guests should also consider packing an extra blanket since the evenings can be quite cool in June. Guests are encouraged to bring cell phones, as individual room phones are not available. However, pay phones are within easy walking distance. **No smoking or alcohol use is allowed anywhere in the facility, including the bedrooms.**

In addition to the standard dorm rooms, a very limited number of deluxe rooms ("suites") are available. These are similar to upscale motel rooms. Most have two double beds but one has a single queen. All have private bathrooms, air conditioning, telephones, a bar sink, microwaves, and refrigerators. Half of the rooms, including the queen suite, have views of Grizzley Peak, which will be assigned first. The other half have "garden views." These rooms are a bit more expensive than the standard dorm rooms. Doubles are $41.50 per person per night, or $48.00 per person with the all-you-can-eat breakfast. Singles are $72.00 per night, or $78.50 with breakfast.

Length of stay in residence halls: The Pacific Division has reserved a block of rooms for the nights of Friday, June 10 through Thursday, June 17. You may choose which of these nights you wish to stay in University housing. There is a two night minimum stay.

Residence Hall Check-in: Normal check-in is at 3:00 p.m. Early arrival may be accommodated in a variety of ways from storing luggage until later to finding that your room is already available. A week-long parking permit may be purchased for $10.00 (daily permits are $5.00) from the residence hall staff. Lists of guests and their room assignments will be posted on both the north (parking lot side) and west (facing Indiana Street) entrances to the building. Go directly to your room for more information. Residence hall doors are locked from 7:00 p.m. to 7:00 a.m. If you arrive during this time, go to the west entrance (facing Indiana Street), where you will find instructions on how to contact residence hall staff and a campus telephone marked by a blue light.

Dining: Limited on-campus dining is available for meeting participants. Cascade Dining Hall provides breakfast for those staying in the residence halls and who paid an additional fee. Others may pick up a quick bite at the Hannon Library Coffee Shop, located at the main entrance to the library. The Coffee Shop provides a selection of drinks, including specialty coffees, soft and other drinks, bakery items, and prepared sandwiches, wraps, and salads. Additionally, there are several eateries adjacent to campus, which are just a short walk from the meeting site. Registrants will be provided with a list of

Cox Hall, Southern Oregon University

nearby restaurants for their dining pleasure. Downtown Ashland, about a mile from campus, boasts a number of restaurants from casual to elegant.

Local off-campus accommodations: There are many hotels and motels in the Ashland area. A complete list may be found on the internet by clicking on the appropriate links at http://www.sou.edu/AAASPD/Ashland2005/Housing.html. A list of local motels and hotels that offered meeting attendees special rates and hold blocks of rooms follows.

- **Ashland Springs Hotel**
  212 East Main Street, Ashland, OR 97520
  541-488-1700
- **Stratford Inn**
  555 Siskiyou Boulevard, Ashland, OR 97520
  541-488-2151
- **Plaza Inn and Suites at Ashland Creek**
  98 Central Avenue, Ashland, OR 97520
  888-488-0358 or 541-488-8900
- **La Quinta Inn & Suites**
  434 Valley View Road, Ashland, OR 97520
  800-531-5900 or 541-482-6932
- **Manor Motel**
  476 North Main Street, Ashland, OR 97520
  541-482-553
- **Holiday Inn Express**
  565 Clover Lane, Ashland, OR 97520
  541-201-0202

- **Windmill Inn and Suites of Ashland**
  2525 Ashland Street, Ashland, OR 97520
  800-547-4747 or 541-482-3010
- **Oak Street Cottages**
  171 Oak Street, Ashland, OR 97520
  541-890-6462

Note that 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: Southern Oregon University is located about 15 miles north of the California border on Interstate 5.

FROM THE SOUTH: Take Exit 14 from I-5. Turn left at the stop sign and follow Hwy 66 (Ashland Street) toward town. Bear right onto Siskiyou Blvd. at the third signal and follow one of these options:

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

• To drive onto campus for the meeting, turn left at the second signal (Mountain Ave.). Proceed up the hill to the STOP (Ashland St.) and turn left. Free meeting parking is in Lot #30, at the corner of Mountain Ave. and Ashland St.

FROM THE NORTH: take Exit 19 from I-5. Turn right at the stop sign and proceed to the signal (Hwy 99). Turn left onto Highway 99 and continue driving about 3.5 miles, through downtown Ashland to Mountain Ave. (a signal). Follow one of these options:

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

• To drive onto campus for the meeting, turn right onto Mountain Avenue. Proceed up the hill to the STOP (Ashland St.) and turn left. Free meeting parking is in Lot #30, at the corner of Mountain Ave. and Ashland St.

By Air: Ashland is not served by a commercial carrier. However, Medford (about 15 miles northwest of Ashland) is served by several major airlines. Car rentals are available at the airport. Both Cascade Airport Shuttle (541-488-1998) and Yellow Cab Shuttle Service (541-482-3065) service Ashland from the airport. Advance reservations are required for both shuttle services. Rates and advance reservation forms for Yellow Cab Shuttle Service may be found by visiting their website, www.yellowcabofsouthernoregon.com. Pricing is competitive between the two shuttle companies. The airport is about 25 minutes from the University.

Parking: Persons staying in the residence halls need to purchase parking permits from the residence hall staff. Be sure to park only in the correct lots! Persons coming for the day may park in Lot #30 at no charge. Lot #30 is a student lot (marked GREEN) at the intersection of Mountain Ave. and Ashland St. Look for AAASPD signs marking it. It is about a two minute walk to the Sciences Building, which fronts Ashland Street. Limited on-street parking is also available in the neighborhood surrounding the Sciences Building.

REGISTRATION CENTER

The Registration Center is in the lobby of the Science Building (SCIENCES). It will be open the following times.
Sunday, 2:00 p.m. – 5:30 p.m.
Monday, 7:30 a.m. – 5:00 p.m.
Tuesday, 7:30 a.m. – 5:00 p.m.
Wednesday, 8:00 a.m. – 3:00 p.m.
Please stop by for early morning coffee or just to say hi.

MESSAGES

541-552-6474 is the telephone number to use to leave messages for meeting attendees. This number is ordinarily staffed Monday through Friday 8:00 a.m. – 12:00 p.m. and 1:00 p.m. – 5:00 p.m. At other times call 541-552-6747 and leave a message. A board for the posting of messages will be at the Registration Center. Emergency messages for persons staying in on-campus housing may be left at 541-552-6375 between 8:00 a.m. and 5:00 p.m. Between 5:00 p.m. and 8:00 a.m. messages should be left with the residence hall staff assigned to our group.

EMERGENCIES

If no one is at the Registration Desk or in SCIENCES, Room 174, call one of these numbers. On-campus callers can ignore the prefix and simply dial 2 plus the last four digits.
8:00 a.m. – 5:00 p.m. call 541-552-6258.
5:00 p.m. – 8:00 a.m. call 541-552-6911.

E-MAIL

Computers for checking your e-mail will be available in SCIENCES, Room 164 at the following times:
Monday: 8:00 a.m. – 4:30 p.m.
Tuesday: 8:00 a.m. – 4:30 p.m.
Wednesday: 8:00 a.m. – 3:00 p.m.

SPEAKER'S PREVIEW ROOM

Speakers may preview their material in SCIENCES, Rooms 102 (M – W) and 225 (M and Tu). Overhead and slide projectors will be available, as will be a computer running Windows XP and PowerPoint XP connected to a video projector.

BREAKS

Mid-morning and mid-afternoon breaks will be scheduled for each session, as appropriate. Refreshments will be served

during break times in the hallway near the Registration Center. Please join us for snacks and conversation.

MEETING ROOMS and TIMES of PRESENTATIONS

This year's technical sessions will meet in the Sciences Building (SCIENCES) and also the Hannon Library. Meeting rooms will be equipped with a 35 mm slide projector, an overhead projector, a Windows-based computer running Windows XP, PowerPoint XP, and a standard computer projector. Speakers requiring other specialized equipment must have made their requests known when they submitted their abstracts. Specialized equipment, such as VHS/TV, will be provided if available. If rental costs are incurred for specialized equipment, payment will be the responsibility of the requestor.

The meeting rooms and times of presentations are published in the "Program with Abstracts" issue of the *Proceedings* (vol. 24, part 1), which is given to each person who has registered for the meetings.

COMPUTERS and POWERPOINT PRESENTATIONS

All meeting rooms will be outfitted with a PC running Windows XP and projecting to a large screen. Loaded onto each computer will be PowerPoint (PP) XP. If you are planning to use PP for your presentation, you must make sure that it will run on the Office XP version of PP. Only CD-ROMs and thumb/USB/flash drives may be used to load presentations onto the computer. *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 is planned for this meeting. It will run from 4:00 p.m. to 9:30 p.m. on Monday, June 13 in the alcove overlooking the rotunda on the third floor of the Hannon Library. Also in the Library that evening will be an invited lecture and a reception sponsored by SOU President Elisabeth Zinser.

Posters will be assigned a numbered display space of 40" tall X 60" wide (1 m X 1.5 m). If you need more space or the opposite orientation, you should have contacted the Division office in advance. *By action of the Pacific Division Council in order to assure fairness, all student posters must fit within the assigned display space of 40" X 60" (either orientation) 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. Presenters should have their posters set up no later than 3:50 p.m. on Monday. The board number for each presentation will be listed in these *Proceedings*. Be sure to use the correct board for your poster! It is expected that each presenter will be available to discuss their poster for at least one hour during the session. Students, however, must be present for judging for Awards of Excellence, so they should expect to spend additional time with their posters. Posters should remain up through the entire poster session. Although no formal poster session is planned for Tuesday, presenters are encouraged to leave their posters up through 4:00 p.m. Tuesday to allow a wider audience to view them. Presenters need not be present during this extended time. Additional information may be found on page 37.

SPECIAL EVENTS

It would be unthinkable to visit Ashland without being given the opportunity to attend one or more plays produced by the nationally renowned Oregon Shakespeare Festival (OSF). We have chosen four plays, one contemporary, one not so contemporary, and two Shakespearean, to offer to meeting registrants. Two are in the outdoor Elizabethan Theatre and two are indoors in the Angus Bowmer Theatre. Almost all tickets are seated in the C-sections, the least expensive areas of the theatres. It is hard to find a bad seat in the OSF theatres. We worked with the OSF group ticket sales agents to get the best possible seats at the most reasonable prices. We obtained only a limited number of tickets for each performance. If you are interested in attending a play but didn't purchase tickets in advance, inquire at the Registration Desk to see if any are available. At least one member of a family unit requesting tickets must be registered for the meeting.

Saturday Evening Play at Oregon Shakespeare Festival: 8:30 p.m. in the Angus Bowmer Theatre. This evening's play is ROOM SERVICE, "a screwball homage to theatre, made famously funny by the Marx Brothers. In 1938, this classic American farce had 'em rolling in the aisles. Aspiring theatrical impresario Gordon Miller has what might be The Great American Play. He doesn't have the dough to produce it, and he's teetering on the brink of eviction from the White Way Hotel. Can he hoodwink the hotel management long enough to scrape together the money? And just how many starving theatre artists can you jam into one room? This tribute to the high-wire enterprise of putting on a new play revels in eccentric characters and wicked one-liners worthy of Groucho himself." –OSF

Sunday Evening Lecture: Jon Christensen (Stanford University), will present a talk on "From the Tide Pool to the Stars: Sailing with the Spirits of John Steinbeck and Ed Ricketts on a New Journey of Discovery to the Sea of Cortez." 6:30 p.m. in SCIENCES, Room 118.

Sunday Evening Welcome Wagon and Cracker Barrel Mixer: 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. 7:30 – 9:00 p.m. in SCIENCES, Room 171.

Sunday Evening Play at Oregon Shakespeare Festival. 8:30 p.m. in the Elizabethan Theatre. This evening's play is Shakespeare's LOVE'S LABOR'S LOST. "Love is the teacher and love is the lesson. In Shakespeare's giddy word-feast, Ferdinand, King of Navarre, and three of his friends decide to give up women and the world to devote themselves to learning. but their foolish vows can't bar love—from their gates or from their hearts. Certainly not when four high-spirited, highbred ladies arrive on the scene. Their unexpected entrance throws the noble scholars—and the pedants and peasants of the neighboring countryside—into romantic upheaval. Can the men pursue the ladies without breaking their oaths? Will these sophisticated young women consent to be courted by such fickle young men? Will love's labors be lost or won?" –OSF

Monday Noon Event (repeated in the afternoon): "An Interactive Journey from Newton to Einstein: What The Heck Is Wave/Particle Duality Anyhow?" Dr. Stanley Micklavzina (University of Oregon).

Is light a wave of energy or is it made up of particles that behave like ball bearings and transfer energy when they strike a surface? How do Einstein's theories affect our everyday life? Why does the air we breathe collapse a 55 gallon drum?

Questions like these will be addressed when "Dr. Stan" offers two special performances of his Science Circus in a tribute to World Year of Physics 2005, a celebration marking the hundredth anniversary of Einstein publishing three great papers that drastically changed the course of scientific research and our everyday understanding of the world we live in.

The shows, aimed at all age groups, will be at 12:15 p.m. and at 2:30 P.M. on Monday, June. 13, at Southern Oregon University in the Science Building, Room 118.

A faculty member in the University of Oregon Department of Physics, Micklavzina has earned such renown for his physics demonstrations that he was tapped by the American Physical Society to represent the Northwest on the international planning team for World Physics Year 2005. Micklavzina is in his 20th year of "coordinating the universe around us in such a way as to demonstrate, in action, the nature of a phenomenon being discussed in theory." The Science Circus promotes the sciences through entertaining and exciting demonstrations. Micklavzina's mission is to spark an interest in science in young minds and to show the public how physics surrounds us in everyday life.

Monday Evening Lecture. Aden B. Meinel and Marjorie P. Meinel (retired, University of Arizona and Jet Propulsion Laboratory, Pasadena) will speak on "The Saga of the Ice Ages: Is the Next One Overdue?" 7:15 p.m. in the Meese Room (room 305) of the Hannon Library.

Monday Evening President's Reception. Following the Meinels' talk, Southern Oregon University President *Elisabeth Zinser* will welcome conferees at an informal reception. All participants and their families are invited to enjoy this relaxed occasion. Nonregistered family members are welcome, but must be accompanied by a registrant. Please wear your registration badge. This event follows the Meinel lecture in the Meese Room (room 305) of the Hannon Library.

Tuesday Noon Lecture: Garniss H. Curtis (emeritus, University of California, Berkeley and Berkeley Geochronology Laboratory) and Robin H. Curtis (San Rafael, CA) will give their presentation "Geomorphic Evidence for Life on Mars." 12:15 p.m. in SCIENCES, Room 118.

Tuesday Evening Reception, Banquet, and Announcement of the Winners of the Student Awards for Excellence. The Division Banquet will be held Tuesday evening beginning at 6:00 p.m. at the Stevenson Union on the Southern Oregon University campus. The cost is $22 per person and you must have purchased your ticket in advance. Students who are in competition for an Award of Excellence are invited to attend as guests of the Division, but must have indicated their desire to attend on their advance registration form.

Dinner will be preceded by a no-host reception, starting about 6:00 p.m. The following entrees are offered for dinner: Rosemary Roasted Chicken Breast (chicken breast marinated with rosemary, lemon juice, garlic, and Dijon mustard), Native American Style Grilled Salmon (rubbed with fresh sage, lemon, and garlic) and Portabella Napolian (portabella mushrooms, roasted vegetables and tofu with roasted red pepper sauce—our vegetarian offering). Choices were made on the Advance Registration Form.

Following dinner, AAAS Pacific Division President Dr. Lynn M. Dudley will give the Presidential Lecture, "Plants Don't Read the Literature: A Soil Scientist Encounters Thomas Khun," and Division representatives will announce the names of student winners of sectional and affiliated society Awards of Excellence and also winners of the Division's Laurence M. Klauber Award for Excellence (unrestricted), Geraldine K. Lindsay Award for Excellence in the Natural Sciences, J. Thomas Dutro, Jr. Award for Excellence in the Geosciences, Rita W. Peterson Award for Excellence in Science Education, the President's Award for Excellence (unrestricted), the Best Poster Award (for poster presentations only but otherwise unrestricted), and the AAAS–Robert I. Larus Travel Award, which provides for travel and other expenses for the awardee to attend the 2006 Annual Meeting of AAAS in St. Louis, MO, February 16 - 20, in order to present his/her winning presentation as a poster at the meeting.

Wednesday Business Meeting of the Council of the Pacific Division: The Council of the AAAS Pacific Division will hold its annual breakfast business meeting starting at 7:00 a.m. in the Meese Room (room 305) in the Hannon Library. The Council will elect officers, discuss programs for the 2006 and 2007 annual meetings and transact other such business as is required by the Division's By-laws. Guests are welcome to attend the meeting.

Wednesday Noon Lecture: Dr. Fred C.C. Peng (Taipei Veterans General Hospital, Taipei, Taiwan) will present his thoughts on "Dementia Is Not A Disease: What Is It?" 12:15 p.m. in SCIENCES, Room 118.

Wednesday Evening Lecture: At 7:00 p.m. in SCIENCES, Room 118 Drs. J. Thomas Dutro, Jr. and Alan E. Leviton will give the illustrated talk, "Volcanoes in Our Neighborhood: The Story of the Middle Cascades – An Introduction to the Post-meeting Field Trip." This is a preview to the two and one half day field trip that leaves the following morning but is also suitable for anyone interested in learning more about the volcanoes of the middle Cascades.

Wednesday Evening Play at Oregon Shakespeare Festival: 8:30 p.m. in the Elizabethan Theatre. This evening's play is THE TRAGICAL HISTORY OF DOCTOR FAUSTUS, by Christopher Marlowe. "The devil will have his due. Doctor Faustus is going to Hell. In this epic theatrical masterpiece—the first great poetic tragedy in English drama—Marlowe presents a burning question: What does it profit a man if he gains the whole world but loses his immortal soul? Driven by curiosity and ambition, Faustus signs a pact with dark forces and embarks on a breathtaking journey through time and space with the devil Mephostophilis as his guide. The horror of damnation is obscured by the wonders heaped upon him: unlimited access to forbidden knowledge, heady encounters with the legendary and powerful, the satisfaction of every desire. Lucifer's generosity is boundless—until the clock strikes midnight." –OSF

Thursday Evening Play at Oregon Shakespeare Festival: 8:30 p.m. in the Angus Bowmer Theatre. This evening's play is RICHARD III, by William Shakespeare. "Meet the most charismatic villain ever to command a stage. He's Shakespeare's Richard III—the man audiences have loved to hate for 400 years. Deformed in body and spirit, this engaging monster is obsessed with power. Driven by bloody ambition, cursed by nightmares and a chorus of queens, Richard grinds his adversaries beneath his lurching feet until he bestrides beleagured England like a malevolent colossus. Does he fall? Of course, but not before he has taken us all on a wild and wickedly entertaining ride." –OSF

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, the Pacific Division is pleased to announce that starting with this meeting winners will also receive a one year student membership in AAAS. Societies often supplement these awards with their own cash prizes.

In 2005, seven Division-wide awards are available: the Laurence M. Klauber Award for Excellence (unrestricted); the Geraldine K. Lindsay Award for Excellence in the Natural Sciences; the J. Thomas Dutro, Jr. Award for Excellence in the Geosciences; the Presidents' Award for Excellence (unrestricted); the Rita W. Peterson Award for Excellence in Science Education; the 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 2006 national meeting of AAAS in St. Louis, MO, February 16 – 20, 2006, 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, 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 website. Students who are eligible for Awards of Excellence are invited to be the Division's guests at the Division Banquet Tuesday evening, June 14. 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 entree you wish to have.

PUBLIC LECTURES and EVENTS

Members of the general public are invited to attend these special lectures at no cost.

Sunday, June 12
6:30 p.m.
SCIENCES, Room 118

"From the Tide Pool to the Stars: Sailing with the Spirits of John Steinbeck and Ed Ricketts on a New Journey of Discovery to the Sea of Cortez." *Dr. Jon Christensen* (Stanford University).

Monday, June 13
12:15 p.m. and 2:30 p.m.
SCIENCES, Room 118

"Newton to Einstein: What The Heck Is Wave/Particle Duality Anyhow?" *Dr. Stanley Micklavzina* (University of Oregon). This is a highly entertaining presentation designed to enthrall

people of all ages while dealing with a topic of immense importance to physicists. Please refer to the description on page 9 of these *Proceedings.* It is presented as a tribute to the World Year of Physics – 2005.

Monday, June 13
7:15 p.m.
Hannon Library, Meese Room (Room 305)

"The Saga of the Ice Ages: Is the Next One Overdue?" *Dr. Aden B. Meinel* and *Marjorie P. Meinel, M.S.* (emeritus, University of Arizona, Tucson, AZ and Jet Propulsion Laboratory, Pasadena, CA).

Tuesday, June 14
12:15 p.m.
SCIENCES, Room 118

"Geomorphic Evidence for Life on Mars." *Dr. Garniss H. Curtis* (emeritus, University of California, Berkeley, and Berkeley Geochronology Laboratory) and *Robin H. Curtis* (31 Diego St., San Rafael, CA 94903).

Wednesday, June 15
12:15 p.m.
SCIENCES, Room 118

"Dementia Is Not A Disease: What Is It?" *Dr. Fred C.C. Peng*, (Veterans General Hospital–Taipei, Taipei, Taiwan).

Wednesday, June 15
7:00 p.m.
SCIENCES, Room 118

"Volcanoes in Our Neighborhood: The Story of the Middle Cascades – An Introduction to the Post-meeting Field Trip," *Drs. J. Thomas Dutro, Jr.* (U.S. Geological Survey, Room # 308, National Museum of Natural History, MRC-137, Washington, D.C. 20560-0137) and *Alan E. Leviton* (Department of Herpetology, California Academy of Sciences, 875 Howard St., San Francisco, CA 94103).

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, check on availability of space at the Registration Desk.

All field trips depart from the parking lot in front of the Sciences Building on the Southern Oregon University 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 one of the Sunday field trips, 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. Registration will stay open on Sunday until 5:30 p.m. to allow field trippers the opportunity to pick up their registration packets upon their return. Otherwise, registration will open at 7:30 a.m. on Monday.

SATURDAY – SUNDAY

(1) Redwoods, The Oregon Coast, and Life on the Serpentine. Saturday, June 11: 8:00 a.m. – Sunday, June 12 5:00 p.m. Departs from the parking lot in front of the Sciences Building.

Fee: $125 per person double occupancy or $185 single occupancy, which includes transportation, lunch Saturday and overnight accommodations. Participants are responsible for purchasing their own dinner Saturday and breakfast and lunch on Sunday.

Led by Drs. Ronald Nitsos and Frank Lang (both emeritus, Department of Biology, Southern Oregon University, Ashland, OR), this trip leaves from the parking lot in front of the Sciences Building. Explore the uniqueness of the Siskiyou and Coast Mountains. Travel the Redwood Highway, making stops at Eight Dollar Mountain, Rough & Ready Botanical Wayside, Jedediah Smith State Park and Stout Grove. Spend the night in Crescent City, CA, and explore tide pools, Battery Park Lighthouse, the Mouth of the Windchuck River, and Harris Beach State Park (Brookings, OR). Examine plants adapted to serpentine soils in fens and bogs (caution: you may get wet feet!), carnivorous plants (*Darlingtonia*, *Pinguicula*, and *Drosera*), and life in tide pools. The trip includes easy to moderate walking plus some rocky beaches. Bring good walking/hiking shoes. Coastal fog/rain is always a possibility.

Courtesy Daryl Jackson
Darlingtonia

SUNDAY

(2) The Terroir and Wines of the Rogue Valley. Sunday, June 12: 10:00 a.m. – 5:00 p.m. Departs from the parking lot in front of the Sciences Building.

Fee: $35.00, which includes transportation, a short guide and a box lunch.

Led by Dr. Gregory Jones (Department of Geography, Southern Oregon University, Ashland, OR). This trip leaves from the parking lot in front of the Sciences Building. The continuum of issues from grape variety to wine is often embodied in the notion of "terroir", the French concept where both physical and cultural factors interact to define the wine styles and quality that comes from any site or region. The Rogue Valley wine region of southern Oregon is a rapidly growing and recognized wine production region, which is bordered by the Coastal Range to the west, the Cascades to the east, and the Klamath Mountains to the south and drained by its namesake river. The region's geologic history and spatial configuration has created a unique suite of landscapes, soils, and climates from which rise beautiful vineyards and high quality wines. The Rogue Valley is Oregon's most diverse winegrape growing region and is suited to a wide range of grape varieties, including Syrah, Viognier, Pinot Noir, and Pinot Gris, to name a few. Join us for a field trip through some of southern Oregon's beautiful vineyard landscapes to discuss and experience the terroir, wine, and uniqueness that is the Rogue Valley!

(3) Blue Ledge Mine. Sunday, June 12: 10:00 a.m. - 4:00 p.m. Departs from the parking lot in front of the Sciences Building.

Fee: $35.00, which includes transportation and a box lunch.

Courtesy Kathleen A. Page

Blue Ledge Mine

The Blue Ledge mine is an abandoned underground copper mine located at the 4500 ft elevation in a remarkably beautiful area of the Siskiyou Mountains. It is intermediate in size and has not been subject to remediation efforts. Drs. Kathleen Page, Bill Elliot and Steven Petrovic study the geomicrobiology of acid mine drainage at this site. We will leave from the parking lot in front of the Sciences Building at 10 a.m. and travel through the beautiful Applegate Valley to arrive at the site by 12 p.m. We will hike a forested trail to the lower main adit and enjoy our box lunches in the shade of conifers. Our field trip will include a survey of acid drainage, tailings, mine works, and surrounding ecology. The history, geology, chemistry and microbiology of the mine will be discussed. A unique display of wildflowers along the trail to the upper adits may help to distract us from the steep climb. From the top of the mine, we will have a bird's eye view of the entire mining operation and surrounding forest. We will return to the base of the mine and travel back to SOU, arriving about 4 p.m. Be sure to bring good hiking shoes.

MONDAY

(4) Dam Removal and Riparian Enhancement. Monday, June 13: 1:30 p.m. – 4:00 p.m. Departs from the parking lot in front of the Sciences Building.

Fee: $7.50, which includes transportation and snacks.

Dam removal or breaching (partial removal) is an increasingly common remedy for fish passage, habitat degradation, water quality, and other problems caused by dams in the United States. The Jackson Street Dam, built in 1960 on Bear Creek in Medford, Oregon, resulted in a barrier to migration of Pacific salmon (*Oncorhynchus* spp.) and steelhead (*O. mykiss*), loss of stream habitat, eutrophication, and an algae-choked impoundment in downtown Medford. The 11-foot high concrete and wooden structure was owned and operated by the Rogue River Valley Irrigation District as one of its primary diversions. The dam was breached in 1998, culminating a 13-year, $1.2 million effort led by the Rogue Valley Council of Governments and the Medford Urban Renewal Agency in collaboration with the irrigation district, other government agencies, and local citizens. This field trip, led by Mr. Eric Dittmer (Department of Geology, Southern Oregon University, Ashland, OR), will depart from the parking lot in front of the Sciences Building. It will stop first in Ashland to view the Oak Street diversion structure and irrigation impacts on Bear Creek. The trip will continue to the Jackson Street Dam in Medford to view the new diversion structure, water quality enhancing facilities, and review the process involved in achieving the goals.

Wizard Island in Crater Lake, Oregon.

WEDNESDAY

(5) Serpentine Soils of the Illinois Valley, Southern Oregon. Wednesday, June 15: 9:00 a.m. – 6:00 p.m. Departs from the parking lot in front of the Sciences Building.

Fee: $25.00, which includes transportation and a box lunch.

Sponsored by the Western Society of Soil Science and the Departments of Biology, Chemistry and Geology, Southern Oregon University. The trip will include three stops at serpentine sites. Eight Dollar mountain is a cone-shaped formation of ultramafic rock, primarily peridotite and serpentinite. On its south side, along the scenic Illinois River, we will find stands of Jeffrey pine, a *Darlingtonia* fen, and a recently burned site. *Thlaspi* and other serpentine endemic plants grow on the scree slopes of the north side. Our third stop will be at serpentine deposits along Rough and Ready Creek, at a botanical site managed by the BLM. Dr. Earl Alexander has worked extensively on the soils in this area and will share his expertise with participants. Some locations require walking on slopes with loose footing, and may have poison oak present. Items to consider bringing: camera, sun hat, sun glasses, long pants and long sleeved shirt, sturdy shoes, walking stick.

THURSDAY

(6) Cascade-Siskiyou National Monument. Thursday, June 16: 9:00 a.m. – 4:00 p.m. Departs from the parking lot in front of the Sciences Building.

Fee: $35.00, which includes transportation and a box lunch.

Join Brian Barr of the World Wildlife Fund on a tour of southwestern Oregon's ecological treasure – the Cascade-Siskiyou National Monument. Sitting just east of Ashland, OR at the junction of three very distinctive ecoregions, the Cascade-Siskiyou National Monument is a melting pot of biological diversity. In recognition of the vast number of plant and animal species that reside in this area, President Clinton designated 52,000 acres of Bureau of Land Management administered lands a national monument in 1999. This all-day tour will bring you to a wide variety of forested and meadow habitats including seeps, springs, riparian areas – the diversity of these habitats over such close quarters complementing and lending to the biological richness of the monument. At these locations, we will discuss the biodiversity of the area, its significance, and the reasons for embracing national monument status at this incredible place.

THURSDAY – SATURDAY

(7) Subduction and the Southern Cascade Volcanoes. Thursday, June 16, 8:00 a.m. – Saturday, June 18, 5:00 p.m. Departs from the parking lot in front of the Sciences Building.

Fee: $250 per person double, $365 single, which includes transportation, three lunches, guidebooks and two nights at Mazama Village (at Crater Lake but not the Crater Lake Lodge). Other meals and items of personal nature are the responsibility of participants.

Led by Drs. J. Thomas Dutro, Jr., (U.S. Geological Survey, ret.) and Alan E. Leviton (California Academy of Sciences), this post-meeting two and a half day trip will depart from in front of the SOU Sciences Building. We will examine the Southern Cascades as a case study of subduction processes in geology. Time and weather permitting, we will examine the Newberry volcano and Three Sisters area on Thursday, spend Friday at Crater Lake with personnel from the National Park Service, and on Saturday visit Lava Beds National Monument and Mt .Shasta. The trip will develop the story of the origin of the Cascade chain, tracing the volcanism from the ultramafics and basalts of the west to the andesites and rhyolites of the eastern part of the range. The age relationships of the rocks

and the volcanoes will be outlined and the volcanic future of the region will be explored.

WORKSHOPS

SCIENCE EDUCATION ENRICHMENT
Tuesday, June 14

Demonstration of Science Educational Enrichment Programs at the University of California, Berkeley, for Students in Grades 9 through 12. Presented by Dr. William B.N. Berry (Department of Earth & Planetary Sciences, University of California, Berkeley, CA). The workshop will focus on a project used by University of California, Berkeley undergraduates in providing enrichment of science education for high school students in grades 9 through 12. The science behind the project will be discussed. Undergraduates will talk about how science education is enhanced and high school students become engaged in learning through design, development and production of a product.

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. 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. Please be sure to wear your meeting badge to each session. Space is on an “as-available” basis and preregistration is not required. Bio-Rad representatives will provide certificates of attendance for those desiring to utilize these workshops for professional development credits.

Wednesday, June 15
All sessions meet in SCIENCES, Room 165.

8:30 a.m.: Genes in a Bottle. Extract and bottle your own DNA. Introduce your students to molecular biology with their own DNA! In this activity, you will extract and bottle the DNA from your own cheek cells to make a necklace. This real-world laboratory procedure is used to extract DNA from many different organisms for a variety of applications and integrates multiple life science standards in a single lesson. Seeing DNA makes it real. Be the first at your school to wear your DNA!

10:30 a.m.: ELISA Immuno Explorer. Biology's magic bullet. Explore immunology with this topical, new hands-on classroom lab. ELISA (enzyme-linked immunosorbent assay) is a powerful antibody-based test used to detect diseases such as HIV/AIDS and SARS, and to trace pathogenic agents in water, food, and the air whether these emerge naturally or through acts of aggression. You will simulate the spreading of a disease, perform ELISA, and learn how this assay is used to identify and track agents of disease , or to detect molecular markers of cancer, pregnancy, and drug use. This kit integrates multiple standards in a single lesson, including antigen-antibody interactions and the role antibodies play in medicine, epidemiology, and biotechnology.

1:30 p.m.: PV92 PCR. What pair of genes are you wearing? PCR is central to forensic science and many medical, archaeological, and ecological procedures. You will extract DNA from your own hair samples, then amplify and fingerprint a pair of alleles, an Alu repeat within PV92, a real forensic marker. This activity integrates multiple life science standards in a single lesson and covers a range of core content areas, from DNA replication to evolution to Hardy-Weinberg equilibrium theory.

Thursday, June 16
All sessions meet SCIENCES, Room 164.

9:00 a.m.: GMO Investigator/Analysis. Have your favorite foods been genetically modified (GM)? Currently, genetically modified organisms (GMOs) in foods do not have to be labeled in the US. Regardless of where you stand in the GM debate, wouldn't it be fun to know if the corn or soy-based foods you eat are GMO foods? This kit uses DNA extraction techniques, PCR, and gel electrophoresis to test common grocery store food products for the presence of GMO foods. This activity integrates and reinforces multiple life science standards in a single lesson.

1:00 p.m.: Protein Fingerprinting. Can molecular evidence support evolution? DNA gets a lot of attention but proteins do all the work. Proteins give organisms their form and function and are the raw material for evolution because natural selection acts on phenotypes. Over time, accumulated changes in DNA (genotypes) lead to variation and ultimately, speciation. You will extract muscle proteins from both closely and distantly related species of fish and use protein electrophoresis to generate protein fingerprints to look for variations. This activity integrates multiple life science education standards in a single lesson from physiology to the theory of evolution to exploring the molecular framework of biology. DNA > RNA > Protein > Trait.

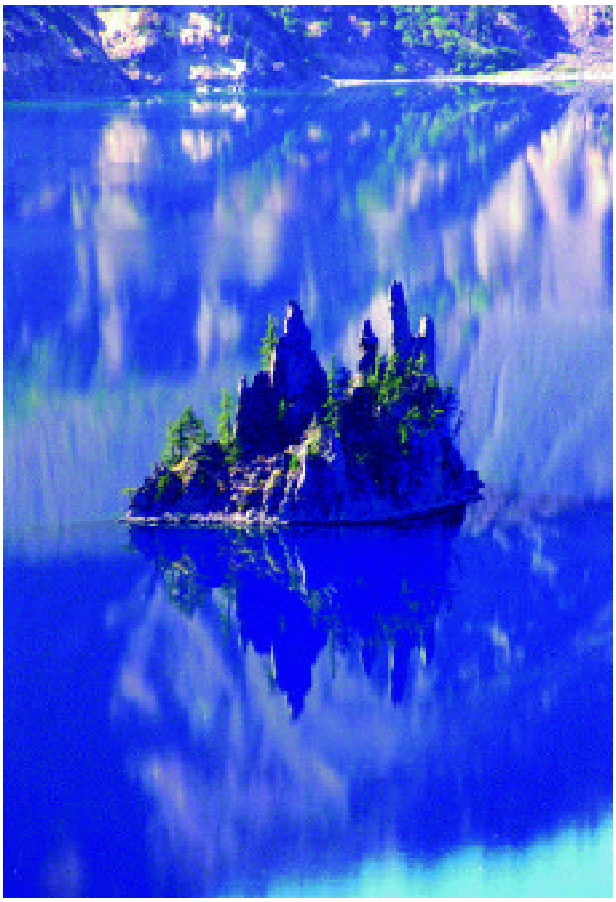
SCIENCE and RELIGION: SOME CRITICAL QUESTIONS

Science and Religion: Some Critical Questions, organized by Prakash Chenjeri (Philosophy and Honors Programs, Southern Oregon University). This workshop examines the conflict between science and religion. The idea that science and religion are in conflict with one another is actually fairly

recent. It arose primarily in the last part of the nineteenth century, in particular after the publication of Darwin's book on evolution by natural selection. In the wake of the uproar over Darwin's idea that humans were descended from apes, some on both sides tried to paint the other side as the enemy. A key factor in this schism was the publication of two books that specifically portrayed religion as the enemy of science. The first, History of the Conflict Between Science and Religion by John Draper, a medical school professor, was released in 1874. The second, a detailed, two volume work titled, The History of the Warfare Between Science and Theology in Christendom by Andrew Dickson White, the first president of Cornell University and a great champion of science, was released in 1896. Although there have always been people on both sides who did not see a conflict between science and Christian faith, nonetheless the "warfare" model has had a powerful influence on Western thinking throughout the twentieth century.

Two video presentations will explore several key questions in this fascinating debate. "Faith and Reason" will explore the efforts made by scientists and theologians to find common ground between their seemingly opposing fields. "What About God?" will look at the same question by drawing on real human stories struggling to find a balance between religion and science. Discussion will follow each video showing. A selection of books on the topic will be available for participants to browse and read as time permits.

Wednesday, June 15
SCIENCES, Room 225
Session I: 9:00 a.m. – 12:00 p.m.
Session II: 1:30 p.m. – 4:30 p.m.



Phantom Ship, Crater Lake, Oregon.

notes

GENERAL SESSIONS

Sunday, June 12

EVENING PUBLIC LECTURE

SCIENCES, Room 118
Sunday
6:30 p.m.

"From the Tide Pool to the Stars: Sailing with the Spirits of John Steinbeck and Ed Ricketts on a New Journey of Discovery to the Sea of Cortez." *Dr. Jon Christensen* (Stanford University).

WELCOME WAGON/CRACKER BARREL

SCIENCES, Room 171
Sunday
7:30 p.m.

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

Monday, June 13

NOON PUBLIC EVENT

SCIENCES, Room 118
Monday
12:15 p.m. and 2:30 p.m.

"Newton to Einstein: What The Heck Is Wave/Particle Duality Anyhow?" *Dr. Stanley Micklavzina* (University of Oregon). This is a highly entertaining presentation designed to enthrall people of all ages while dealing with a topic of immense importance to physicists. Please refer to description on page 9 of these *Proceedings*. It is presented as a tribute to the World Year of Physics – 2005.

WESTERN SOCIETY of SOIL SCIENCE

Business Meeting
SCIENCES, 067
Monday
2:45 p.m.

EVENING PUBLIC LECTURE

Hannon Library, Meese Room (305)
Monday
7:15 p.m.

"The Saga of the Ice Ages: Is the Next One Overdue?" *Dr. Aden B. Meinel* and *Marjorie P. Meinel, M.S.* (emeritus, University of Arizona, Tucson, AZ and Jet Propulsion Laboratory, Pasadena, CA).

SOU PRESIDENT'S RECEPTION

Hannon Library, Meese Room (305)
Monday
8:15 p.m.

Southern Oregon University President Dr. Elisabeth Zinser will welcome conferees at an informal, hosted reception. All registrants and their families are invited to enjoy this relaxed occasion. Non-registered family members are welcome, but must be accompanied by a registrant. Please wear your registration badge.

Tuesday, June 14

NOON PUBLIC LECTURE

SCIENCES, Room 118
Tuesday
12:15 p.m.

"Geomorphic Evidence for Life on Mars." *Dr. Garniss H. Curtis* (emeritus, University of California, Berkeley, and Berkeley Geochronology Laboratory) and *Robin H. Curtis* (San Rafael, CA).

RECEPTION and STUDENT AWARDS BANQUET

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

The annual Pacific Division Student Awards Banquet will be held on the SOU campus in the Stevenson Union, Rogue River Room. Starting at 6:00 p.m. will be a no-host reception. Wine, beer and a variety of soft drinks will be available. Dinner will start about 7:00 p.m. The cost is $22 and you must have purchased a ticket in advance. Students who are in competitiion for Awards of Excellence are invited to be guests of the Division. Students must have indicated their intention of attending the banquet on their registration form and must have picked up their ticket by noon on Tuesday at the Registration Desk. 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. Lynn Dudley*, AAAS Pacific Division President and Professor of Plants, Soils and Biometeriology at Utah State University, Logan, UT will top off the evening by giving the annual Presidential Lecture, "Plants Don't Read the Literature: A Soil Scientist Encounters Thomas Khun."

Wednesday, June 15

COUNCIL of the PACIFIC DIVISION

Business Meeting
Hannon Library, Meese Room (Room 305)
Wednesday
7:00 a.m.

The Council of the AAAS Pacific Division will hold its annual breakfast business meeting beginning at 7:00 a.m. on Wednesday, June 16. The Council will elect officers, discuss programs for the 2006 and 2007 annual meetings, and transact such other business as is required by the Division's By-laws. Visitors are welcome.

NOON PUBLIC LECTURE

SCIENCES, Room 118
Wednesday
12:15 p.m.

"Dementia Is Not A Disease: What Is It?" *Dr. Fred C.C. Peng*, (Veterans General Hospital–Taipei, Taipei, Taiwan).

EVENING PUBLIC LECTURE

SCIENCES, Room 118
Wednesday
7:00 p.m.

"Volcanoes in Our Neighborhood: Story of the Middle Cascades – An Introduction to the Post-meeting Field Trip," Drs. *J. Thomas Dutro, Jr.* (US Geological Survey, Room # 308, National Museum of Natural History, MRC-137, Washington, D.C. 20560-0137) and *Alan E. Leviton* (Department of Herpetology, California Academy of Sciences, 875 Howard Street, San Francisco, CA 94103).

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 13

HALF-DAY SYMPOSIA
MONDAY MORNING

GEOLOGY, CHEMISTRY and MICROBIOLOGY of ACID MINE DRAINAGE and ITS REMEDIATION

SCIENCES, Room 108
Monday
8:45 a.m. – 12:00 p.m.

Program organizers: Kathleen A. Page[1], Steven Petrovic[2] and William S. Elliot[3] (Departments of [1]Biology, [2]Chemistry and [3]Geology, Southern Oregon University, Ashland, OR).

Sponsored by: Pacific Division Sections on Biological Sciences, Chemistry, and Earth Sciences.

Acid Mine Drainage (AMD) poses a water quality problem for wildlife and human populations throughout the world. Acid mine waters often have pH values ranging from 0 to 4 and concentrations of toxic metals capable of killing aquatic organisms. AMD is an unfortunate consequence of mining that exposes reduced sulfide minerals associated with some ore bodies. Bacteria that respire on reduced sulfides catalyze acid production and mineral dissolution. This symposium will facilitate a multidisciplinary approach to understanding AMD-related problems. Speakers with expertise in chemistry, geology, hydrology, microbiology, and mine remediation will report results of their studies from sites of AMD.

Chair: Kathleen A. Page (Department of Biology, Southern Oregon University, Ashland, OR).

0845 *Welcome and introductions*.

0850 *Geochemical and Microbiological Processes in Acid Mine Waters from Iron Mountain, CA to Rio Tinto, Spain*, **D. KIRK NORDSTROM** (U.S. Geological Survey, 3215 Marine St., Boulder, CO).

0935 *Evidence for Metal Attenuation in Acid Mine Water by Sulfate Reduction, Penn Mine, Calaveras County, California*, **CLINTON D. CHURCH[1], CHARLES N. ALPERS[2], ROBERT O. RYE[3], and RICHARD T. WILKIN[4]** ([1]U.S. Geological Survey, San Diego, CA; [2]U.S. Geological Survey, Sacramento, CA; [3]U.S. Geological Survey, Denver, CO; and [4]U.S. Environmental Protection Agency, Ada, OK).

BREAK

1020 *Geochemistry and Isotopic Composition of H_2S-Rich Water in Flooded Underground Mine Workings, Butte, Montana*, **AMBER ROESLER and CHRIS GAMMONS** (Department of Chemistry and Geochemistry, Montana Tech of the University of Montana, Butte, MT).

1045 *Algal Bioremediation of the Berkeley Pit Lake System: An In-Situ Test Using Limnocorrals*, **NICHOLAS J. TUCCI and GRANT G. MITMAN** (Departments of Biology and Geochemistry, Montana Tech of The University of Montana, Butte, MT).

1110 *Chemical and Geological Aspects of Acid Mine Drainage at the Blue Ledge Mine, Siskiyou County, California*, **WILLIAM S. ELLIOTT[1], JR, WES W. SHERLOCK[2], and STEVEN C. PETROVIC[1]** (Departments of Geology and Chemistry, Southern Oregon University, Ashland, OR; [2]Department of Geological Sciences, University of Nevada, Reno, NV).

1135 *Bacterial Ecotypes Associated with Waste Rock at a Site of Acid Mine Drainage*, **KATHLEEN A. PAGE[1] and ALAN B. OPPENHEIMER[2]** ([1]Southern Oregon University, Department of Biology, Ashland, OR; [2]Open Door Networks, OR).

CHEMICAL EDUCATION

SCIENCES, Room 215
Monday
8:25 a.m. – 12:00 p.m.

Program organizer: Owen McDougal (Department of Chemistry, Southern Oregon University, Ashland, OR).
Sponsored by: Pacific Division Sections on Chemistry and Science and Technology Education.

This symposium addresses the topic of chemical education in the community, high school, and university. Subject material focuses on the efforts made by educators at all levels to modify chemical education in an attempt to address concerns regarding recruitment and retention of future scientists. The goal is to provide an educated and competent pool of future scientists that are environmentally conscientious and resourceful. Whether the ultimate objective is graduate studies or the workforce, the fundamental concepts of general science education must be established.

Chair: Owen McDougal (Department of Chemistry, Southern Oregon University, Ashland, OR).

0825 *Welcome and introductions.*

0830 *Chemistry and the Community,* **CHELSEA GUSTAFSON, PHIL CLARK, and JENNIFER WALKER** (Department of Chemistry, Southern Oregon University, Ashland, OR).

0855 *High School, District and No Child Left Behind,* **JACK JAMES** (Chemistry Instructor, South Medford High School, Medford, OR).

0920 *Challenges of Presenting a Significant Laboratory Experience in the Secondary Classroom,* **RICHARD O. MIKULA** (Instructor of Chemistry, Ashland High School, Ashland, OR).

0945 *GEMs: A Database of Greener Education Materials for Chemists,* **JULIE HAACK** (Department of Chemistry, University of Oregon, Eugene, OR).

BREAK

1020 *Whose Situation Is It Anyway?* **GAUTAM BHATTACHARYYA** (Department of Chemistry, University of Oregon, Eugene, OR).

1045 *Peer-Led Team Learning in the Instruction of Organic Chemistry,* **HALA SCHEPMANN and LYNN KIRMS** (Department of Chemistry, Southern Oregon University, Ashland, OR).

1110 *Structural Determination of Three Unknown Molybdenum Compounds - A Guided-Inquiry Based Laboratory Experiment for Inorganic Chemistry,* **LAURA HUGHES** (Department of Chemistry, Southern Oregon University, Ashland, OR).

1135 *Transition from Undergraduate to Graduate Studies: How Will My Nobel-Prize Winning Research Be Funded and By Whom?* **CHRISTOPHER J. BORMAN** (Department of Chemistry, Laramie, WY).

THE WISE PROJECT: ENHANCING WATER MANAGEMENT TECHNIQUES BENEFITING BOTH AGRICULTURE and INSTREAM NEEDS

SCIENCES, Room 275
Monday
9:10 a.m. – 12:00 p.m.

Program organizer: Eric Dittmer (Environmental Sciences Program and Department of Geology, Southern Oregon University, Ashland, OR).
Sponsored by: Pacific Division Section on Ecology and Environmental Science.

The history, development and goals of the Water for Irrigation Streams and the Economy (WISE) Project will be presented. The WISE Project was proposed to address both water quantity and quality problems facing agriculture and instream needs in Jackson County in SW Oregon. There is simply not enough water to meet all consumptive and instream needs. In order to address the problem, a combination of increased storage, innovations in water conservation and the use of reclaimed water is being investigated. A varied group of stakeholders is working collaboratively with government agencies to develop what could be a $100 million project to create a truly state-of-the-art water management system in the Rogue Valley.

Presenters will speak to the key issues of the project development, the use of reclaimed water, the benefits to agriculture and instream needs as well as the environmental impacts involved in constructing such an ambitious project.

The symposium will close with the speakers forming a panel to answer questions and to receive input and suggestions from the audience about their experiences on other water resource enhancement efforts around the country.

Chair: Eric Dittmer (Environmental Sciences Program and Department of Geology, Southern Oregon University, Ashland, OR).

0910 *Welcome and introductions.*

0920 *The WISE Project – An Innovative Approach to Water Management for Agricultural and Instream Needs,* **STEVE MASON** (WISE Project Program Manager, Ashland, OR).

0940 *Addressing Irrigation Water Needs Using Reclaimed Water,* **JIM HILL** (Water Reclamation Division Administrator, City of Medford, Medford, OR).

BREAK

1020 *Supporting Innovations in Irrigation Water Management,* **KEITH EMERSON** (Orchard Director, Bear Creek Corporation, 2518 S. Pacific Highway, Medford, OR 97501).

1040 *The Instream Benefits of the WISE Project,* **STEVE PARRETT** (Oregon Water Trust, Portland, OR).

1100 *Environmental Impacts of Converting Irrigation Canals to Pipes,* **ERIC DITTMER** (Department of Geology and Environmental Studies Program, Southern Oregon University, Ashland, OR).

1120 *The Wetland Ecology Trial Mapping and Assessment Project (WETMAP): A Preliminary Analysis of Relationships Between Leaking Canals and Artificial Wetlands,* **MARTINIAN R. PRINCE** (Environmental Studies Program, Southern Oregon University, Ashland, OR).

1140 *Audience input and discussion.*

HALF-DAY SYMPOSIA
MONDAY AFTERNOON

NEW HUMANITIES and SCIENCE CONVERGENCES

SCIENCES, Room 108
Monday
1:30 p.m. – 5:00 p.m.

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

Sponsored by: Pacific Division Section on General and Interdisciplinary Studies.

This multidisciplinary symposium explores new or recent connections between the humanities and science in order to survey positive cross-fertilizations they produce. C. P. Snow's "two cultures" designation of decades ago seems belied by a growing, respectful melding of concerns that move beyond simplistic fact/value contraries. Unforeseen collaborations of unique kinds between science on the one hand and art, literature, music, and architecture on the other mark the current interdisciplinary scene. Mainstream medical science finds applications of various arts in healing; artists evolve rich content, forms, and technique from contemporary science theory and practice. New aesthetically posed plasticized anatomy models as well as new imaging modalities for the body, nature, and cosmos draw scientists toward the problematics of art. Eco-artists find inspiration and motivation from ecological science. New postmodern theorists find in scientific theory potential sources of new meta-narratives or fundamental principles that check the radical relativism of contemporary postmodern thought. The symposium seeks to survey collaborations that eclipse former antagonisms between science and the humanities and provoke questions about the very nature of each area as they draw from and influence each other. Papers for panel presentations should highlight the potential for creative work and new directions emerging from new humanities and science convergence.

Chair: Robert L. Chianese (California State University, Northridge, CA).

1330 *Welcome and introductions.*

1340 *Varieties of Science-Humanities Convergences: Survey and Reflections,* **ROBERT LOUIS CHIANESE** (Department of English, California State University Northridge, Northridge, CA).

1400 *Relativity in Science-Fiction: the Einsteinian Kurt Vonnegut,* **MATT BERNSTEIN** (California State University Northridge, Northridge, CA).

1415 *Scientific Influences on Frank Gehry's Disney Hall,* **KARIN SABO** (California State University Northridge, Northridge, CA).

1430 *The Language Instinct, The Film Instinct: An Investigation,* **AMY E. TILLMAN** (Georgia State University, Atlanta, GA).

BREAK

1510 *The New Ethnobotany: Complexities of Commerce and Health,* **BARBARA YABLON MAIDA** (Department of Geography, University of California Los Angeles, Los Angeles, CA).

1525 *Space, Technology, and the Possibility of Dialogue between Engineers and Literary Critics,* **J.N. NODELMAN** (Department of English, University of Alberta, Edmonton, AB, CANADA).

1540 *In the Wake of Steinbeck and Ricketts: Connecting History, Literature and Ecology in the Sea of Cortez Expedition and Education Project,* **JON CHRISTENSEN** (History Department and Center for Environmental Science and Policy, Stanford Institute for International Studies, Stanford University, Stanford, CA).

1600 *Science as Narrative: Perspectives on Sustainability in the Social Sciences,* **CARL A. MAIDA (**University of California, Los Angeles, Los Angeles CA).
1620 *Discussion.*

Tuesday, June 14

ALL DAY SYMPOSIA
TUESDAY

ICE AGE PEOPLES of the PACIFIC NORTHWEST

SCIENCES, Room 275
Tuesday
9:20 a.m. – 4:00 p.m.

Program organizer: Nina G. Jablonski (Department of Anthropology, California Academy of Sciences, San Francisco, CA).
Sponsored by: Pacific Division Section on Anthropology and Archaeology.

The last decade has witnessed a great resurgence of interest and research on the topic of the peopling of the Americas. This has been spurred on by insights provided by the integration of information from diverse disciplines, including archaeology, geology, paleoecology, historical linguistics, molecular evolutionary studies, and biological anthropology. With the growing recognition that colonization of the Americas involved both coastal and inland routes, and may have begun as early as 13,000 or 14,000 years ago, great interest in the earliest peoples of the Pacific Northwest has emerged. This symposium will bring together a distinguished group of archaeologists and biological anthropologists to discuss how the late Ice Age peoples of the Pacific Northwest settled into the New World and made a living. The picture that emerges is one of great ecological opportunities for humans offset by significant and unknown perils and hardships.

Chair: Nina G. Jablonski (Department of Anthropology, California Academy of Sciences, San Francisco, CA).
0920 *Setting the stage: Who were the first Ice Age people of the Pacific Northwest?* **NINA G. JABLONSKI** (Department of Anthropology, California Academy of Sciences, San Francisco, CA).
0940 *The Pattern and Antiquity of Regional Genetic Continuity in Native North America,* **DAVID GLENN SMITH and JOHN W. MCDONOUGH** (Molecular Anthropology Laboratory, University of California, Davis, CA).

BREAK

1030 *Mitochondrial DNA Evidence for a Prehistoric Population Intrusion into the Pacific Northwest,* **RIPAN S. MALHI** (Molecular Anthropology Laboratory, University of California, Davis, CA).
1100 *Analysis of Ancient DNA from an Individual from Prince of Wales Island: Implications for the Peopling of the New World,* **BRIAN M. KEMP, DAVID GLENN SMITH, JASON ESHLEMAN, RIPAN S. MALHI, JOHN MCDONOUGH, E. DEBORAH BOLNICK, JAMES DIXON, TIMOTHY H. HEATON, TERENCE FIFIELD, and ROSITA WORL (**Molecular Anthropology Laboratory, Department of Anthropology, University of California, Davis, CA).
1130 *Language Groups and Coastal Connections: mtDNA in Western North America,* **JASON A. ESHLEMAN** (Trace Genetics, Inc., Richmond, CA).

LUNCH

1330 *Pleistocene Vertebrates and Cordilleran Glaciation in Southwestern British Columbia: Implications for Possible Early Human Migrations,* **MICHAEL C. WILSON** (Department of Geology and Department of Anthropology, Douglas College, New Westminster, BC, Canada).
1400 *Diets and Technology for Survival in an Ancient Arid Land: The Paisley Caves 10,000 - 12,000 B.C.,* **DENNIS L. JENKINS** (Museum of Natural and Cultural History, University of Oregon, Eugene, OR).

BREAK

1450 *Paleoecology and Human Biological Models for the Pacific Northwest Coast in the Late Pleistocene,* **ROBERTA L. HALL** (Anthropology Department, Oregon State University, Corvallis, OR).
1520 *Ice Age peoples of the Pacific Northwest and the Vitamin D Imperative,* **NINA G. JABLONSKI** (Department of Anthropology, California Academy of Sciences, San Francisco, CA).
1550 *Brief discussion and conclusions.*

MATERIALS SCIENCE and NANOPARTICLES

SCIENCES, Room 067
Tuesday
9:00 a.m. – 3:00 p.m.

Program organizers: Sidney C. Abrahams, Panos Photinos and Peter Wu (Department of Physics and Engineering, Southern Oregon University, Ashland, OR).
Sponsored by: Pacific Division Sections on Engineering and Industrial Sciences and Physics.

This symposium is designed as an opportunity for educators, researchers and their students in the Northwest to present their current work to an interested and knowledgeable audience. Topics cover the synthesis, characterization and applications of novel smart materials.

Co-chairs: Sidney C. Abrahams, Panos Photinos and Peter Wu (Department of Physics and Engineering, Southern Oregon University, Ashland, OR).

0900 *Welcome and opening remarks.*

0905 *Ferromagnetic Semiconductors for Prospective Spintronics Applications,* **BJOERN SEIPEL[1], AMITA GUPTA[1,2,3], CHUNFEI LI[1], K. VENKAT RAO[2], NIGEL D. BROWNING[3,4], ROLF ERNI[4*] and PETER MOECK[1]** ([1]Department of Physics, Portland State University, Portland, OR; [2]Department of Materials Science, The Royal Institute of Technology, Stockholm; [3]National Center for Electron Microscopy, Lawrence Berkeley National Laboratory; [4]Department of Chemical Engineering and Materials Science, University of California-Davis, Davis, CA, *now at FEI Electron Optics, Eindhoven).

0925 *Advances in Nanoscale Sample Handling and Manipulation,* **JOSEPH C. ROBINSON** (President, Ascend Instruments, Beaverton, OR).

9045 *Image-based Nanocrystallography, Discrete Atomic Resolution Electron Tomography, and Tilt Protocol/ Lattice-fringe Fingerprinting,* **PETER MOECK[1], BJOERN SEIPEL[1], WENTAO QIN[2], ERIC MANDELL[3], and PHILIP B. FRAUNDORF[3]** ([1]Department of Physics, Portland State University, Portland, OR; [2]Freescale Semiconductors™; [3]University of Missouri at St. Louis, St. Louis, MO).

BREAK

1020 *Advancements Towards the Synthesis of $(Bi_2Te_3)_x(Sb_2Te_3)_y$ Superlattices,* **CLAY D. MORTENSEN, RAIMAR ROSTEK, BENJAMIN A. SCHMID, and DAVID C. JOHNSON** (University of Oregon, Department of Chemistry, Eugene, OR).

1040 *Enhanced Heat Transfer through the Use of Nanofluids In Forced Convection,* **DANIEL FAULKNER[1], JUSTIN DAVIDSON[1], REZA SHEKARRIZ[1], and DAVID RECTOR[2]** ([1]MicroEnergy Technologies, Inc., Portland, OR; [2]Pacific Northwest National Laboratory, Richland, WA).

1100 *High Electron Mobility Transparent Conductors,* **P.F. NEWHOUSE[1], C.-H. PARK[1], D.A. KESZLER[1], J. TATE[2], and P.S. NYHOLM[3]** ([1]Department of Chemistry, Oregon State University, Corvallis, OR; [2]Department of Physics, Oregon State University, Corvallis, OR; [3]Hewlett-Packard Company, Corvallis, OR).

1120 *Preparing Washington's Companies to Excel in the Nanotechnology Revolution,* **R. LEE CHEATHAM** (Washington Technology Center, University of Washington, Seattle, WA).

LUNCH

1330 *Crystal Engineering of Novel Chalcogenides: Films and Bulk,* **DAVID C. JOHNSON** (Materials Science Institute, University of Oregon, Eugene, OR).

1410 *Misfit Layer Compound$(Bi_2Te_3)_X$ $(SnTe)_Y$ as a Thermoelectric Material,* **SISSI L. LI, MARY SMELLER, NGOC NGUYEN, and DAVID C. JOHNSON** (University of Oregon, Department of Chemistry, Eugene, OR).

1430 *Thermal Dependence of $K_2Cr_2O_7$ Structure through the Phase II-to-Phase I Transition,* **MICHAEL ANDRUS, JASON MATTHEWS, PETER WU, PANOS PHOTINOS and SIDNEY C. ABRAHAMS** (Department of Physics and Engineering, Southern Oregon University, Ashland, OR).

SERPENTINE ECOLOGY

SCIENCES, Room 108
Tuesday
8:30 a.m. – 4:30 p.m.

Program Organizers: Christine Oswald and Darlene Southworth (Department of Biology, Southern Oregon University, Ashland, OR 97520).
Sponsored by: Western Society of Soil Science and the Pacific Division Sections on Biological Sciences, Earth Sciences, and Ecology and Environmental Sciences.

A broad overview of soils, fungi, plants and animals on serpentines, particularly in Oregon and California, bringing

together diverse areas of expertise to better understand the functioning of these unique ecosystems.

Chair: Christine Oswald (Department of Biology, Southern Oregon University, Ashland, OR).

0830 *Welcome and introductions.*

0840 *Serpentine Soils along a Precipitation Gradient in Northwestern California,* **R.C. GRAHAM[1], T.E. LAURENT[2] and K.L. ROSE[1].** ([1]Soil & Water Sciences Program, University of California, Riverside, CA; [2]Klamath National Forest, Yreka, CA).

0910 *Serpentine Soils and Vegetation from Alaska to Baja,* **EARL B. ALEXANDER** (Soils and Geoecology, Concord, CA).

0940 *Serpentinite Soil Ecology on Cyprus: A Reappraisal of a Foundation of the Soil Erosion Paradigm,* **JAY S. NOLLER** (Department of Crop and Soil Science, Oregon State University, Corvallis, OR).

BREAK

1020 *A Geochemical Analysis of Serpentine Soils for the Reintroduction of San Francisco Owl's Clover,* **ANDREW MATTHEW and MATTHEW J. LAFORCE** (San Francisco State University, San Francisco, CA).

1050 *Phylogenetic Comparisons of Bacterial Communities from Serpentine and Non-Serpentine Soils,* **DAVID K. OLINE** (Department of Biology, Southern Oregon University, Ashland, OR).

1120 *Patterns of Ectomycorrhizal Communities Associated with* Quercus garryana *on Serpentine Soils,* **MARIAH MOSER, JAD D'ALLURA and DARLENE SOUTHWORTH** (Departments of Biology and Geology, Southern Oregon University, Ashland, OR).

LUNCH

1330 *Reproductive Biology of an Endangered Serpentine Endemic plant,* Phlox hirsuta *(Yreka Phlox),* **JULES FILIPSKI** (Department of Biology, Southern Oregon University, Ashland, OR).

1350 *Hyperaccumulation, Nutrient Cycling and Detritivores,* **MICHEAL A.DAVIS[1], ROBERT S. BOYD[2], KEVIN BALKWILL[3] and MICHAEL A. WALL[3]** ([1]Department of Biological Sciences, University of Southern Mississippi, Hattiesburg, MS; [2]Department of Biological Sciences, Auburn University, Auburn, AL; [3]Department of Animal, Plant and Environmental Sciences, University of Witwatersrand, South Africa).

1420 *Hyperaccumulation: Plant Defense and Food Web Consequences,* **ROBERT S. BOYD** (Department of Biological Sciences, Auburn University, Auburn, AL).

BREAK

1510 *Biogeochemistry and Phytoextraction of Nickel in Serpentine Soil,* **PAUL R. GROSSL** (Dept. Plants, Soils, and Biometeorology, Utah State University, Logan, UT).

1540 *From Rock to Blood: Evaluating The Geochemistry and Fate of Serpentine Soil Trace Metals,* **CHRISTOPHER OZE** (Department of Earth Sciences, Dartmouth College, Hanover, NH).

1610 *Ingestion, Accumulation, and Physiological Effects of Nickel in Deer Mice (*Peromyscus maniculatus*) and Wood Rats (*Neotoma fuscipes*) from Serpentine and Non-Serpentine Areas of Southern Oregon,* **CHRISTINE OSWALD[1] and MATTHEW TODD[2]** ([1]Department of Biology, Southern Oregon University, Ashland, OR; [2]Department of Science, Grants Pass High School, Grants Pass, OR).

RESOURCE PRESERVATION and RESEARCH at CRATER LAKE NATIONAL PARK, OREGON: STUDIES of LAKE and TERRESTRIAL ECOSYSTEMS

SCIENCES, Room 118
Tuesday
8:00 a.m. – 4:30 p.m.

Program organizers: Mark Buktenica, Crater Lake National Park and Department of Biology, Southern Oregon University, Ashland, OR; Michael Murray, Crater Lake National Park; Gary Larson, USGS Forest and Rangeland Ecosystem Science Center, Corvallis, OR; Scott Girdner, Crater Lake National Park; and Robert Collier, College of Atmospheric and Oceanic Sciences, Oregon State University, Corvallis, OR.

Co-sponsored by the National Park Service, Crater Lake National Park, and the Pacific Division Sections on Biological Sciences and Ecology and Environmental Sciences.

Crater Lake National Park provides an excellent natural laboratory for studying aquatic and terrestrial environments in the Southern Oregon Cascade Mountains. Nearly 266 square miles of terrestrial ecosystems occur within Crater Lake National Park including subalpine meadows, caves, snowfields, pumice barrens, bogs, old-growth, and timberline forests. An elevational expanse of 5,000 feet straddling two ecoregions (eastern and western cascades) adds to the diversity of this

park. This symposium highlights some of the most recent research conducted at the park.

The deepest lake in the United States, Crater Lake, is internationally renowned for its aesthetic beauty, extremely clear water and, increasingly, for a growing body of scientific understanding of lake ecosystem structure and function. This symposium will feature several studies reported in an upcoming special issue of the international journal Hydrobiologia featuring studies on Crater Lake. Symposium presentations may include papers on mass wasting and filling of the caldera; water budget; water quality; hydrocarbon contamination; optical properties; lake circulation; particle flux; modeling of lake circulation, nutrients, light, phytoplankton assemblages; phytoplankton nutrient limitations; bacteria; zooplankton; and fish.

PART I
AQUATIC ECOSYSTEMS

Chair: Mark Buktenica (Crater Lake National Park, Crater Lake, OR).

0800 *Welcome and introductions.*

0805 *History of the Long-term Lake Monitoring Program at Crater Lake National Park, Oregon*, **GARY LARSON[1] and MARK BUKTENICA[2]*** ([1]USGS Forest and Rangeland Ecosystem Science Center, Corvallis, OR; [2]Crater Lake National Park, Crater Lake, OR).

0825 *Evaporation and the Crater Lake Water Budget,* **KELLY REDMOND** (Western Regional Climate Center, Desert Research Institute, Reno, NV).

0845 *Hypolimnetic Ventilation in Crater Lake: The Long and Short (Time Scales) of It,* **GREGORY B. CRAWFORD[1]* and ROBERT W. COLLIER[2]** ([1]Dept. Oceanography, Humboldt State University, Arcata, CA; [2]College of Oceanic and Atmospheric Sciences, Oregon State University, Corvallis, OR).

0905 *Ultraviolet Radiation in Crater Lake, Oregon,* **BRUCE R. HARGREAVES[1], SCOTT F. GIRDNER[2]*, MARK W. BUKTENICA[2], ROBERT W. COLLIER[3], ENA URBACE[4], and GARY L. LARSON[5]** ([1]Department of Earth & Environmental Sciences, Lehigh University, Bethlehem, PA; [2]Crater Lake National Park, Crater Lake, OR; [3]College of Oceanic and Atmospheric Sciences, Oregon State University, Corvallis, OR; [4]Department of Agronomy, University of Wisconsin-Madison, Madison, WI; [5]USGS Forest and Rangeland Ecosystem Science Center, Corvallis, OR).

0925 *Predicting Secchi Disk Depth from Average Beam Attenuation: Towards a Solution to Surface Problems in Deep, Ultra-Clear Lakes,* **GARY L. LARSON, ROBERT L. HOFFMAN*, BRUCE R. HARGREAVES, and ROBERT W. COLLIER** (USGS-FRESC, Corvallis, OR).

0945 *Seasonal and Interannual Variability in the Taxonomic Composition and Production Dynamics of Phytoplankton Assemblages in Crater Lake, Oregon,* **C. DAVID McINTIRE[1]*, GARY L. LARSON[2], and ROBERT E. TRUITT[3]** ([1]Department of Botany and Plant Pathology, Oregon State University, Corvallis, OR; [2]U. S. Geological Service, Forest and Rangeland Ecosystem Science Center, Corvallis, OR; [3]National Park Service, Ashland, OR).

BREAK

1020 *Seasonal Nutrient and Plankton Dynamics in a Physical-Biological Model of Crater Lake,* **KATJA FENNEL[1], ROBERT COLLIER[2]*, GARY LARSON[3], GREG CRAWFORD[4], and EMMANUEL BOSS[5]** ([1]Institute of Marine and Coastal Sciences, Rutgers University, New Brunswick, NJ; [2]College of Oceanic and Atmospheric Sciences, Oregon State University, Corvallis, OR; [3]USGS Forest and Rangeland Ecosystems Center, Forest Science Laboratory, Oregon State University, Corvallis, OR; [4]Department of Oceanography, Humboldt State University, Arcata, CA; [5]School of Marine Sciences, University of Maine, Orono, ME).

1040 *Distribution and Abundance of Zooplankton Populations in Crater Lake,* **GARY LARSON[1], C. DAVID McINTIRE[2], MARK BUKTENICA[3], SCOTT GIRDNER[3], and ROBERT TRUITT[4]** ([1]USGS Forest and Rangeland Ecosystem Science Center, Corvallis, OR; [2]Department of Botany and Plant Pathology, Oregon State University, Corvallis, OR; [3]Crater Lake National Park, Crater Lake, OR; [4]National Park Service, Ashland, OR).

1100 *Natural Variability of Fish Population Dynamics in a Lake with no Manipulative Management,* **MARK BUKTENICA[1]*, SCOTT GIRDNER[1], GARY LARSON[2] and C. DAVID McINTIRE[3]** ([1]Crater Lake National Park, Crater Lake, OR; [2]USGS, Forest and Rangeland Ecosystem Science Center, Corvallis, OR; [3]Department of Botany and Plant Pathology, Oregon State University, Corvallis, OR).

1120 *Multibeam Mapping of Crater Lake, Oregon and Application of Sonar Data to Model a Submerged Moss Community,* **PETER DARTNELL[1]*, GARY LARSON[2], ROBERT COLLIER[3], MARK BUKTENICA[4], and JAMES GARDNER[5]** ([1]U.S. Geological Survey, Menlo Park, CA; [2]U.S.Geological Survey, Forest and Rangeland Ecosystem Science Center, Corvallis, OR; [3]College of Oceanic and Atmospheric Sciences, Oregon State University, Corvallis, OR; [4]Biology Department, Southern Oregon University, Ashland, OR; [5]Center for Coastal and Ocean Mapping, University of New Hampshire, Durham, NH).

1140 *Crater Lake, Oregon: Lake Ecology and Research Developed into a K-12 Inquiry Curriculum Using the Internet*, **JOHN SALINAS[1]*, KATHLEEN SALINAS[1], LAURA MISARAS[2], and MARSHA McCABE[3]** ([1]Rogue Community College, Grants Pass, OR; [2]Soaring Enterprises, Eugene, OR; [3]National Park Service, Crater Lake, OR).

LUNCH

PART II
TERRESTRIAL ECOSYSTEMS

Chair: Michael Murray (Crater Lake National Park, Crater Lake, OR).

1330 *Welcome and introductions.*

1335 *Crater Lake National Park's Terrestrial Environment: Recent Findings, Current Issues and Future Imperatives*, **MICHAEL P. MURRAY** (Crater Lake National Park, Crater Lake, OR).

1355 *Prescribed Fire at Crater Lake: Burning, Beetles, and Beyond*, **DAN PERRAKIS** (College of Forest Resources, University of Washington, Seattle, WA).

1415 *Response of Ectomycorrhizal Fungal Fruiting Patterns to Different Fire Prescriptions at Crater Lake National Park*, **MATT TRAPPE and KERMIT CROMACK, JR**. (Department of Environmental Sciences, Oregon State University, Corvallis, OR).

1435 *Structural and Community Development Following Severe Wildfire in a Montane Forest*, **JOHN K. WILSON[1], and J. BOONE KAUFFMAN[2]** ([1]Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR; [2]Institute of Pacific Islands Forestry, USDA Forest Service, PSW Research Station, Honolulu, HI).

BREAK

1510 *Blister Rust: Developing Resistance to a Non-Native Tree Disease*, **RICHARD A. SNIEZKO** (USDA Forest Service, Dorena Genetic Resource Center, Cottage Grove, OR).

1530 *Species of Special Concern in Crater Lake National Park: Initial Findings and Implications for Long-term Monitoring*, **DANIEL A. SARR, ANDREW DUFF, and SEAN B. SMITH** (Klamath Network-National Park Service, Ashland, OR).

1550 *Bird Monitoring and Inventory in Crater Lake National Park*, **JOHN D. ALEXANDER[1], JAIME L. STEPHENS[1], NATHANIEL E. SEAVY[1], and DANIEL A. SARR[2]** ([1]Klamath Bird Observatory, Ashland, OR; [2]Klamath Network – National Park Service, Ashland, OR).

1610 *A Contribution to Our Knowledge About the Arthropods of Crater Lake National Park*, **RONALD W. LYONS** (Bandon, OR).

Wednesday, June 15

HALF-DAY SYMPOSIA

WEDNESDAY AFTERNOON

THE CASCADE–SISKIYOU NATIONAL MONUMENT: WHAT IT MEANS TO BE A BIOLOGICAL CROSSROADS

SCIENCES, Room 118
Wednesday
1:30 p.m. – 5:00 p.m.

Program organizer: Brian R. Barr (Program Officer, World Wildlife Fund Klamath–Siskiyou Field Office, Ashland, OR).

Sponsored by the Pacific Division Section on Biological Sciences.

In 1999, President Clinton designated 52,000 acres of Bureau of Land Management administered lands in southwestern Oregon as the Cascade-Siskiyou National Monument in recognition of the diverse plant and animal life residing in this area. Straddling the crest of the Cascade Mountains, the Cascade-Siskiyou National Monument is located where three very distinctive ecoregions come together: the high desert of the Columbia/Snake shrub steppe to the east, the young, volcanic Central/Southern Cascades, and the ancient, uplifted Klamath-Siskiyou to the west. The diverse elements from each of these ecoregions are well represented within the Cascade-Siskiyou National Monument's vascular plant, butterfly, mollusk, and bird communities. This symposium will provide a glimpse into the dizzying array of species residing in the monument and highlight the importance of protecting this landscape.

A field trip follows on Thursday, June 16 (see page 13 of this *Proceedings*), which is designed to complement this symposium. The field trip costs an additional fee and must have been signed up for in advance.

Chair: Brian R. Barr (Program Officer, World Wildlife Fund Klamath–Siskiyou Field Office, Ashland, OR).

1330 *Welcome and introductions.*

1340 *Patterns of Vegetation Change and Past Management Activities of the Cascade-Siskiyou National Monument,* **PAUL E. HOSTEN** (Bureau of Land Management, Medford District, Medford, OR).

1405 *Landbird Species Diversity in the Cascade-Siskiyou National Monument, as Compared with Crater Lake National Park and Whiskeytown National Recreation Area,* **JOHN D. ALEXANDER[1], NAT SEAVY[1,2], DANIEL A. SARR[3], and PAUL E. HOSTEN[4]** ([1]Klamath Bird Observatory, Ashland, OR; [2]University of Florida, Department of Zoology, Gainseville, FL; [3]Klamath Network-National Park Service, Ashland, OR; and [4]Bureau of Land Management, Medford District, Medford, OR).

1430 *Butterflies in the Blender: Patterns of Richness and Diversity in the Cascade-Siskiyou National Monument,* **ERIK B. RUNQUIST** (Section of Evolution and Ecology, University of California, Davis, Davis, CA).

BREAK

1530 *Small Mammal Communities in the Cascade-Siskiyou National Monument,* **AARON JOHNSTON** (Oregon State University, Department of Fisheries and Wildlife, Corvallis, OR).

1555 *Extraordinary Endemic Springsnail Radiation in the Cascade-Siskiyou National Monument, Southwest Oregon,* **TERRENCE FREST and EDWARD JOHANNES** (Deixis Consultants, Seattle, WA).

1620 *Cascade-Siskiyou National Monument – What it Means to be in an Ecological Crossroads,* **DOMINICK DELLASALA** (World Wildlife Fund, Klamath-Siskiyou Ecoregion, Ashland, OR).

1645 *Wrap-up and additional questions.*

notes

II. WORKSHOPS

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 14

DEMONSTRATION of SCIENCE EDUCATIONAL ENRICHMENT PROGRAMS at the UNIVERSITY of CALIFORNIA, BERKELEY for STUDENTS in GRADES 9 – 12

SCIENCES, Room 215
Tuesday
8:30 a.m. – 10:30 a.m.

Program organizer: William B.N. Berry (Department of Earth and Planetary Sciences, University of California, Berkeley, CA).
Sponsored by: Pacific Division Section on Science and Technology Education.

The workshop will focus on a project used by UC Berkeley undergraduates in providing enrichment of science education for high school students in grades 9 through 12. The science behind the project will be discussed. Undergraduates will talk about how science education is enhanced and high school students become engaged in learning through design, development and production of a product.

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

0830 *Welcome and introductory comments.*
0840 *CalSci Academies Increase Student Interest in Science and Enhance College-bound Eligibility,* **RACHELLE CALLENBACK* and STEPHEN P. ANDREWS, JR.** (Environmental Sciences Teaching Program, University of California Berkeley, Berkeley, CA).
0900 *Creating Student Interest in Science: A Design-Build Project for a Personal, Portable Water Purification System*, **HEATHER N. BISCHEL* and STEPHEN P. ANDREWS, JR.** (Environmental Sciences Teaching Program, University of California Berkeley, Berkeley, CA).
0920 *CalPEERS: Innovatove Peer-based Instruction and EIC Learning for Urban Schools,* **TANNER Y.W. ZANE*, PAMELA Z.F. HAN and WILLIAM B.N. BERRY** (Environmental Sciences Teaching Program, University of California Berkeley, Berkeley, CA).
0940 *Dow Wetlands Preserve Provides Practical Research Experiences for Community College Students,* **PAMELA Z.F. HAN* and WILLIAM B.N. BERRY** (Environmental Sciences Teaching Program, University of California, Berkeley, Berkeley, CA).
1000 *Discussion*

Wednesday, June 15

MOLECULAR BIOLOGY KITS , I

SCIENCES, Room 165
Wednesday
8:30 a.m. – 4:00 p.m.

Sponsored by: Bio-Rad Corporation and the Pacific Division Sections on Biological Sciences, Chemistry, and Science and Technology Education.

Bio-Rad Corporation of Hercules, CA, is presenting five 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. There is no additional charge for these workshops. However, participants must be registered for the meeting. A special "workshop-only" meeting registration is available at the reduced fee of $20.00.

0830 *Genes in a Bottle.* Extract and bottle your own DNA. Introduce your students to molecular biology with their own DNA! In this activity, you will extract and bottle the DNA from your own cheek cells to make a necklace. This real-world laboratory procedure is used to extract DNA from many different organisms for a variety of applications and integrates multiple life science standards in a single lesson. Seeing DNA makes it real. Be the first at your school to wear your DNA!
1030 *ELISA Immuno Explorer.* Biology's magic bullet. Explore immunology with this topical, new hands-on classroom lab. ELISA (enzyme-linked immunosorbent assay) is a powerful antibody-based test used to detect diseases such as HIV/AIDS and SARS, and to trace pathogenic agents in water, food, and the air whether these emerge naturally or through acts of aggression. You will simulate the spreading of a disease, perform ELISA, and learn how this assay is used to identify and track agents of disease , or to detect molecular

markers of cancer, pregnancy, and drug use. This kit integrates multiple standards in a single lesson, including antigen-antibody interactions and the role antibodies play in medicine, epidemiology, and biotechnology.

1330 *PV92 PCR.* What pair of genes are you wearing? PCR is central to forensic science and many medical, archaeological, and ecological procedures. You will extract DNA from your own hair samples, then amplify and fingerprint a pair of alleles, an Alu repeat within PV92, a real forensic marker. This activity integrates multiple life science standards in a single lesson and covers a range of core content areas, from DNA replication to evolution to Hardy-Weinberg equilibrium theory.

SCIENCE and RELIGION: SOME CRITICAL QUESTIONS

SCIENCES, Room 225
Wednesday
9:00 a.m. – 4:30 p.m.

Program Organizer: Prakash Chenjeri (Philosophy and Honors Programs, Southern Oregon University, Ashland, OR).
Sponsored by: Pacific Division Section on General and Interdisciplinry Studies.

Science and Religion: Some Critical Questions, organized by Prakash Chenjeri (Philosophy and Honors Programs, Southern Oregon University). This workshop examines the conflict between science and religion. The idea that science and religion are in conflict with one another is actually fairly recent. It arose primarily in the last part of the nineteenth century, in particular after the publication of Darwin's book on evolution by natural selection. In the wake of the uproar over Darwin's idea that humans were descended from apes, some on both sides tried to paint the other side as the enemy. A key factor in this schism was the publication of two books that specifically portrayed religion as the enemy of science. The first, History of the Conflict Between Science and Religion by John Draper, a medical school professor, was released in 1874. The second, a detailed, two volume work titled, The History of the Warfare Between Science and Theology in Christendom by Andrew Dickson White, the first president of Cornell University and a great champion of science, was released in 1896. Although there have always been people on both sides who did not see a conflict between science and Christian faith, nonetheless the "warfare" model has had a powerful influence on Western thinking throughout the twentieth century.

Two video presentations will explore several key questions in this fascinating debate. "Faith and Reason" will explore the efforts made by scientists and theologians to find common ground between their seemingly opposing fields. "What About God?" will look at the same question by drawing on real human stories struggling to find a balance between religion and science. Discussion will follow each video showing. A selection of books on the topic will be available for participants to browse and read as time permits.

0900 Session I, showing "Faith and Reason"

LUNCH

1330 Session II, showing "What About God?"

Thursday, June 16

MOLECULAR BIOLOGY KITS, II

SCIENCES, Room 164
Thursday
9:00 a.m. – 3:30 p.m.

Sponsored by: Bio-Rad Corporation and the Pacific Division Sections on Biological Sciences and Science and Technology Education.

See information on page 29 of these *Proceedings.*

0900 *GMO Investigator/Analysis.* Have your favorite foods been genetically modified (GM)? Currently, genetically modified organisms (GMOs) in foods do not have to be labeled in the US. Regardless of where you stand in the GM debate, wouldn't it be fun to know if the corn or soy-based foods you eat are GMO foods? This kit uses DNA extraction techniques, PCR, and gel electrophoresis to test common grocery store food products for the presence of GMO foods. This activity integrates and reinforces multiple life science standards in a single lesson.

1300 *Protein Fingerprinting.* Can molecular evidence support evolution? DNA gets a lot of attention but proteins do all the work. Proteins give organisms their form and function and are the raw material for evolution because natural selection acts on phenotypes. Over time, accumulated changes in DNA (genotypes) lead to variation and ultimately, speciation. You will extract muscle proteins from both closely and distantly related species of fish and use protein electrophoresis to generate protein fingerprints to look for variations. This activity integrates multiple life science education standards in a single lesson from physiology to the theory of evolution to exploring the molecular framework of biology. DNA>RNA>Protein>Trait.

III. CONTRIBUTED PAPER SESSIONS

1100 (time italicized and underlined) indicates a student presentation in competition for Awards of Excellence
* indicates the speaker from among several authors listed

Monday, June 13

BIOLOGICAL SCIENCES ECOLOGY and ENVIRONMENTAL SCIENCES

ORAL PRESENTATIONS
SCIENCES, Room 275
Monday
1:30 p.m. – 4:10 p.m.

Co-sponsored by the Pacific Division Sections on **Biological Sciences**, Chair: *A. Michelle Wood*, Department of Biology, University of Oregon, Eugene, OR 97403 and **Ecology and Environmental Sciences**, Chair: *Michael S. Parker*, Department of Biology, Southern Oregon University, Ashland, OR 97520.

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

1330 *Relationship Between Body Size and Peak Abundance in Spawning Kokanee*, **MARK C. GROVER** (Department of Biology, Southern Utah University, Cedar City, UT).

1350 *Isolation of Zinc Resistance Genes from* Serratia proteamaculans *by mRNA Subtractive Hybridization*, **MICHAEL BATES*, TARA WOLFLEY, TRISHA KRUEGER, TAYLOR UPDEGROVE and DONALD LIGHTFOOT** (Department of Biology, Eastern Washington University, Cheney, WA).

1410 *Using Macroinvertebrates as a Rapid Assessment Technique for Determining Soil Quality*, **EMILY A. MILLER* and STEPHEN P. ANDREWS, JR.** (Environmental Sciences Teaching Program, University of California Berkeley, Berkeley, CA).

1430 *The Temporal Effects of* Ulex europaeus *on Soil Properties, and Modeling Impact of Invasive Species with Respect to Time*, **BRONWYN SCOTT* and SARAH E. REICHARD** (College of Forest Resources, University of Washington, Seattle, WA).

BREAK

1510 *Assessing Recovery from Salinity Induced Stress in Water Hyacinth*, **PHILLIP WUNDER II* and STEPHEN P. ANDREWS, JR.** (Environmental Sciences Teaching Program, University of California Berkeley, Berkeley, CA).

1530 *The Application of System Engineering Principles and Practices to Systems Biology*, **LAWRENCE H. WOOD** (Systems Engineer, Retired, Lacey, WA).

1550 *A Computational Model for the Study of Genetic Evolution in a Spatially Explicit Context*, **GUY A. HOELZER[1] and RICH DREWES[2]** (Departments of Biology[1] and Computer Science and Engineering[2], University of Nevada Reno, Reno, NV).

POSTER SESSION
Hannon Library, Alcove, Third Floor
Monday
4:00 p.m. – 9:30 p.m.
(Please refer to page 37 of these *Proceedings*.)

HISTORY and PHILOSOPHY of SCIENCE SCIENCE and TECHNOLOGY EDUCATION

ORAL PRESENTATIONS
SCIENCES, Room 215
Monday
1:30 p.m. – 4:30 p.m.

Sponsored by the Pacific Division Sections on **Science and Technology Education,** Chair: *William B.N. Berry*, Department of Earth AND Planetary Sciences, 307 McCone Hall, University of California, Berkeley, CA 94720-4767 and **History and Philosophy of Science**, Chair: *Donald J. McGraw*, 824 Southshore Drive, Chula Vista, CA 91913.

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

1330 *Kuhn Since Kuhn: A Study in the Evolution of Thomas*

S. Kuhn's Philosophy of Science, **SEAN DERMOT LEHANE** (Institute for the History and Philosophy of Science and Technology, Victoria College, University of Toronto, Toronto, Ontario).

1350 *Validating the link between Knowledge and Science Test Items by Examining Test Takers' Talk-Aloud Verbalizations,* **MIN LI and SHIN-PING TSAI** (College of Education, University of Washington, Seattle, WA).

1410 *Validating the Construct of Science Achievement by Using Logical and Factor Analyses,* **SHIN-PING TSAI and MIN LI** (College of Education, University of Washington, Seattle, WA).

1430 *Trend of Middle School Science Teachers' Assessment Practices in Their Classrooms: A Comparison Study Based on the Trend of International Mathematics and Science Study in 1995, 1999, and 2003,* **MING-CHIH LAN and MIN LI** (College of Education, University of Washington, Seattle, WA).

BREAK

1510 *Germinal Scientist: The Development of Scientific Inquiry Skills in Young Children,* **SHU-FANG CHEN and Yi- CHIN TSAI** (Department of Early Childhood Education, National Taitung University, Taiwan).

1530 *The Dental Amalgam Controversy: An Opportunity to Promote Critical Thinking for Introductory Chemistry Students,* **RONALD H. SWISHER, KATHLEEN SALE, ROSE MCCLURE, and CHRISTY VAN ROOYEN** (Natural Science Department, Oregon Institute of Technology, Klamath Falls, OR).

1550 *Ocean Science for Adult and English as a Second Language Learners, Lessons Developed as a Participant in the Ocean and Math Collaborative Project,* **KATHLEEN SALINAS** (Rogue Community College, Grants Pass, OR).

1610 *Creative Imaging Learning System,* **CHARLES I. DANIELS** (Kapiolani Community College, University of Hawaii, Math-Science Department, Honolulu, HI).

POSTER SESSION

Hannon Library, Alcove, Third Floor

Monday

4:00 p.m. – 9:30 p.m.

(Please refer to page 37 of these *Proceedings*.)

WESTERN SOCIETY of SOIL SCIENCE

President: Paul R. Grossl, Department of Plants, Soils and Biometeorology, Utah State University, Logan, UT 84321-4820; grossl@cc.usu.edu.

President-Elect and Program Chair: Grant Cardon,Utah State University, Logan, UT 84321; grantc@ext.usu.edu.

Secretary-Treasurer: Jodi Johnson-Maynard, Department of Plant, Soil, and Entomological Sciences, University of Idaho, P.O Box 442339, Moscow ID 83844-2339; jmaynard@uidaho.edu.

Past President: Matthew La Force, Department of Geosciences, San Francisco State University, 1600 Holloway Ave., San Francisco, CA 94132-4163; laforce@sfsu.edu.

ORAL PAPER SESSION I

SCIENCES, Room 067

Monday

8:55 a.m. – 10:10 a.m.

Presiding: Grant Cardon (Utah State University).

0855 *Welcome,* Paul Grossl (President, WSSS, Utah State University).

0900 *Metal(loid) Solubility in Persistently Reducing Mining-Impacted Wetland Sediments,* **DOUGLAS C. FINKELNBURG*, GORDON R. TOEVS, and MATTHEW J. MORRA** (Environmental Sciences Program and Land Resources Division, University of Idaho, Moscow, ID).

0915 *Erosion Hazard Potential in Laramie River Basin,* **RIFAT AKIS*, LARRY C. MUNN, and J. MICHAEL DANIELS** (Soil Science, Renewable Resources, College of Agriculture, University of Wyoming, Laramie, WY).

0930 *Brassicaceae Seed Meal as a Soil Amendment to Improve Plant-Available Nitrogen and Yields in Organic Farming Systems,* **ALINA RICE*, JODI JOHNSON-MAYNARD, and MATTHEW MORRA** (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Moscow, ID).

0945 *A Spatial Investigation of Bio-Available Phosphorus in Submerged Wetland Soils,* **J.J. MAYNARD*, A.T. O'GEEN, and R.A. DAHLGREN** (Land, Air and Water Resources, University of California, Davis, Davis, CA).

1000 *Discussion/Follow-up*

BREAK

ORAL PAPER SESSION II
SCIENCES, Room 067
Monday
10:30 a.m. – 11:40 a.m.

Presiding: Grant Cardon (Utah State University).

1030 *Assessing Stratified Soil Acidity in Inland Northwest Direct-Seed Cropping Systems,* **TABITHA T. BROWN*, RICHARD T. KOENIG, DAVID R. HUGGINS, JAMES B. HARSH, and RICHARD E. ROSSI** (Crop and Soil Sciences Department, Washington State University, Pullman, WA).

1045 *Carbon Stocks and Patterns in Native Shrub Communities of Sénégal's Peanut Basin,* **A. LUFAFA*, I. DIÉDHIOU, S. NDIAYE, M. SÉNÉ, M. KHOUMA, F. KIZITO, R.P. DICK, and J.S. NOLLER** (Crop and Soil Science Department, Oregon State University, Corvallis, OR).

1100 *Soil Water Balance Dynamics in Two Semi-arid Shrub Communities: A Case for the Millet-Peanut Rotation System in Senegal's Peanut Basin,* **F. KIZITO*, M. I. DRAGILA, M. SENE, A. LUFAFA, R. CUENCA, J. SELKER and R. P. DICK** (Oregon State University, Department of Crop and Soil Science, Corvallis, OR).

1115 *Agroforestry Systems and Soil Nutrient Reserves in Talamanca, Costa Rica,* **LEIGH WINOWIECKI* and PAUL McDANIEL** (University of Idaho, Department of Plant, Soil, and Entomology, Moscow, ID).

1130 *Discussion/Follow-up*

LUNCH

ORAL PAPER SESSION III
SCIENCES, Room 067
Monday
1:30 p.m. – 2:30 p.m.

Presiding: Paul Grossl (Utah State University, Logan, UT).

1330 *Does Serpentinite Mineralogical Variation Affect Clay Mineralogy, Soil Mineralogical Class, and Ca:Mg Ratios?* **DONALD G. McGAHAN*, RANDAL J. SOUTHARD and VICTOR P. CLAASSEN** (Department of Land, Air and Water Resources, Soil Science Graduate Group, University of California Davis, Davis, CA).

1345 *A New Web-Based Outreach Tool for Soil Survey Inquiries,* **A.T. O'GEEN* and D.E. BEAUDETTE** (Land, Air and Water Resources, University of California Davis, Davis, CA).

1400 *Incorporating Classification Trees into a Pedogenic Understanding Raster Classification Methodology, Green River Basin, Wyoming,* **AMY M. SAUNDERS* and JANIS L. BOETTINGER** (Plants, Soils, and Biometeorology Department, Utah State University, Logan, UT).

1415 *Protocol Development, for Soil Survey Updates at Golden Spike National Historic Site,* **JEDD M. BODILY* and JANIS L. BOETTINGER** (Utah State University, Department of Plants, Soils, and Biometeorology, Logan, UT).

1430 *Discussion/Follow-up*

BUSINESS MEETING
SCIENCES, Room 067
Monday
2:45 p.m. – 3:45 p.m.

Presiding: Paul Grossl (President, WSSSUtah State University, Logan, UT).

POSTER SESSION
Hannon Library, Alcove, Third Floor
Monday
4:00 p.m. – 9:30 p.m.
(Please refer to page 37 of these *Proceedings*.)

Tuesday, June 14

ATMOSPHERIC and OCEANOGRAPHIC SCIENCES
EARTH SCIENCES

ORAL PRESENTATIONS
SCIENCES, Room 215
Tuesday
1:30 p.m. – 2:50 p.m.

Co-sponsored by the Pacific Division Sections on **Atmospheric and Oceanographic Sciences**, Chair: *John Carroll*, Dept. of Atmospheric Sciences, University of California, Davis, CA 95616 and **Earth Sciences**, Chair: *J. Thomas Dutro, Jr.*, US Geological Survey, Room E 308, National Museum of Natural History, MRC-137, Washington D.C. 20560-0137.

Chair: John J. Carroll (University of California, Davis, CA).

1330 *Can the Source of the Devils Garden Basalt Flow be Determined by Using NIH Image and StereoWin Software?* **DEBRA HALLIS** (Geology Department, Humboldt State University, Arcata, CA 95521).

1350 *Report on the Ten Year Forecast of the U.S. Remote Sensing Industry,* **GEORGE F. HEPNER**, (Southwest Center for Environmental Research and Policy, Department of Geography, University of Utah, Salt Lake City, UT).

1410 *Some Implications of Seasonal Water Column Stratification at Deception Island and in the Bransfield Strait,* **ANNE STURZ** (Department of Marine Science, University of San Diego, San Diego, CA).

1430 *Wave Force on an Ocean Current,* **KERN E. KENYON and DAVID SHERES** (Del Mar, CA).

POSTER SESSION
Hannon Library, Alcove, Third Floor
Monday
4:00 p.m. – 9:30 p.m.
(Please refer to page 37 of these *Proceedings*.)

Wednesday, June 15

ANTHROPOLOGY
GENERAL and INTERDISCIPLINARY
HISTORY and PHILOSOPHY of SCIENCE
SOCIAL, ECONOMIC and POLITICAL SCIENCES

ORAL PRESENTATIONS
SCIENCES, Room 275
Wednesday
9:10 a.m. – 12:00 p.m.

Co-sponsored by the Pacific Division Sections on **Anthropology**, Chair: *Walter Carl Hartwig*, Division of Basic Medical Sciences, Touro University College of Osteopathic Medicine, Mare Island, CA 94592; **General and Interdisciplinary**, Chair: *Robert Chianese*, Department of English, California State University, Northridge, Northridge, CA 91330; **History and Philosophy of Science**, Chair: *Donald J. McGraw*, 824 Southshore Drive, Chula Vista, CA 91913; **Social, Economic and Political Sciences**, Chair: *Mark Aldrich*, Department of Economics, Smith College, Northampton, MA 01063.

Chair: Robert Chianese (California State University, Northridge, Northridge, CA).

0910 *Welcome*

0920 *The Science of Anthropology: Cultural Patterns and Their Neurological Correlates,* **ROBERT F. MANLOVE** (St. Mary's College of California and City College of San Francisco, San Francisco, CA).

0940 *Peaceful Versus Warlike Societies in Pre-Columbian America and Elsewhere: What Does Archaeology and Anthropology Tell Us?* **JAMES DEMEO** (Orgone Biophysical Research Lab, Ashland, OR).

1000 *Discipline Founding—A Coming to Be: The Disparate Cases of Marine Microbiology and Dendrochronology,* **DONALD J. McGRAW** (Chula Vista, CA).

BREAK

1040 *Participant Observation among Kabbalists Who Construct Their Literature and Activities as Science,* **J. BARRY GURDIN** (To Love and to Work: An Agency for Change, San Francisco, CA).

1100 *An Alternative Theory of Intelligent Design,* **TERRY BRISTOL** (Institute for Science, Engineering and Public Policy, Portland OR).

1120 *The Heraclitean Aspect of the Second Law,* **TERRY BRISTOL** (Institute for Science, Engineering and Public Policy, Portland OR).

1140 *Science and the UFO Phenomenon,* **JAMES W. DEARDORFF** (College of Oceanic & Atmospheric Sciences, Oregon State University, Corvallis, OR).

HEALTH SCIENCES

ORAL PRESENTATIONS
SCIENCES, Room 215
Wednesday
10:15 a.m. – 12:00 p.m.

Sponsored by the Pacific Division Section on **Health Sciences**, Chair: *Carl A. Maida*, Schools of Dentistry and Medicine, University of California, P.O. Box 951668, 63-023 CHS, Los Angeles, CA 90095-1668.

Chair: Carl A. Maida (University of California, Los Angeles, CA).

1015 *Welcome.*

1020 *Hemoglobin Catastrophe, Implication for Clinical Diagnostic and Cooperative Binding,* **DAVID BLACKMAN** (University of California (retired), Berkeley, CA and Albert Schweitzer International University).

1040 *Thermodynamic Elements of the Myocyte*, **DAVID BLACKMAN** (University of California (retired), Berkeley, CA and Albert Schweitzer International University).

1100 *Why Does the Human Body Maintain a Constant 37-Degree Temperature?* **PAUL W. CHUN** (University of Florida College of Medicine, Gainesville, FL).

1120 *The Antiplague Systems of Central Asian and Caucasus Nations: Uncertain Defense Against Especially Dangerous Infectious Diseases*, **RAYMOND A. ZILINSKAS** (Center for Nonproliferation Studies, Monterey Institute of International Studies, Monterey, CA).

1140 *Does a newly discovered Picornavirus causes diabetes?* **WILLIAM KLITZ and BO NIKLASSON** (University of California, Berkeley, CA, and Apodemus AB, Stockholm, Sweden).

POSTER SESSION

Hannon Library, Alcove, Third Floor

Monday

4:00 p.m. – 9:30 p.m.

(Please refer to page 37 of these *Proceedings*.)

notes

IV. CONTRIBUTED POSTERS

(16) (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 the Hannon Library Alcove, next to the rotunda, on the third floor. The poster boards have numbers on them which coincide with the numbers assigned to the posters in this program (see number in parentheses by the title of each presentation). Presenters are expected to use the appropriately numbered display space for their poster. Posters may be set up in the half-hour preceding the starting time of a session and should remain up until the ending time of the session. To allow a larger audience the opportunity to view the posters, we request that presenters leave their posters on display until 4:00 p.m. Tuesday. Presenters assume full responsibility for the security of their poster materials.

Those presenting posters must be present at least one hour during the display period in order to discuss their work. Cards will be provided so that the time when presenters will be on hand can be posted.

Students presenting posters must be present until judging is completed. Ordinarily, two or three judges will visit each student poster.

Monday, June 13

Hannon Library, Alcove, Third Floor
Monday
4:00 p.m. – 9:30 p.m.

ATMOSPHERIC and OCEANOGRAPHIC SCIENCES

(1) *Record Rains in Southern California 2004 – 2005*, **GARY HANNES[1]*, SUSAN HANNES[2], and ANNE HANNES[3]** ([1]Department of Geography, California State University Fullerton, Fullerton, CA; [2]Department of Geography, Santiago Canyon College, Orange, CA; [3]University of California Santa Barbara, Santa Barbara, CA).

BIOLOGICAL SCIENCES

(2) *The New Guinea Singing (Wild) Dog*, **JANICE KOLER-MATZNICK** (The New Guinea Singing Dog Conservation Society, Central Point, OR).

(3) *The New Guinea Singing Dog – Not a Dingo Hybrid*, **BONNIE C. YATES[1*] and JANICE A. KOLER-MATZNICK[2]** ([1]U.S.F.W.S. National Fish and Wildlife Forensics Laboratory, Ashland, OR 97520; [2]The New Guinea Singing Dog Conservation Society, Central Point, OR).

(*4*) *Cardiological Comparison of the* Mytilus *Genus*, **CHASE WARNER** (Hopkins Marine Station, Pebble Beach, CA).

(*5*) *Isolation, Identification and Characterization of Wine Yeasts*, **CHANDA BEEGHLEY* and KATHLEEN A. PAGE** (Southern Oregon University, Department of Biology, Ashland, OR).

(*6*) *Isolation and Characterization of Heterotrophic Bacteria at Blue Ledge Mine*, **BRIANNA KARHU* and KATHLEEN A. PAGE** (Southern Oregon University, Department of Biology, Ashland, OR).

(7) *Sequencing and Characterization of the Alpha Hemoglobin Gene in Elk (*Cervus elaphus canadensis*), and Comparison to Alpha Hemoglobin of the Black Bear (*Ursus americanus*)*, **HEATHER L. MATTSON* and DAVID K. OLINE** (Biology Department, Southern Oregon University, Ashland, OR).

(*8*) *Comparative Phylogeography of Lahontan Cutthroat Trout (*Oncorhynchus clarki henshawi*) and the Paiute Sculpin* (Cottus beldingi*): A Step Towards Ecosystem Management in the Marys River Basin*, **THERESA JENKINS*, GUY HOELZER, and MARY PEACOCK** (Department of Biology, University of Nevada Reno, Reno, NV).

CHEMISTRY

(*28*) *Digitally-Enhanced Thin-Layer Chromatography: An Inexpensive, New Technique for Qualitative and Quantitative Analysis*, **AMBER I. HESS** (Stevenson School, Pebble Beach, CA).

(29) *Characterization of Isostearic Acid as a Pasting Liquid for the Carbon Paste Electrode,* **STEVEN C. PETROVIC** (Department of Chemistry, Southern Oregon University, Ashland, OR).

(30) *Structural studies of the HIV-1 CA N-terminal Domain,* **ROB OSLUND, RYAN VANWOERKOM, RYAN DELUCA, CHAD SANADA, CRAIG HUNTER, and BRUCE HOWARD** (Dept. of Physical Science, Southern Utah University, Cedar City, UT).

(31) *Effect of Counterion Variation in NMR Studies of Reverse Micelles,* **JESSE STEINMAN*, WADE VAN HORN, and PETER FLYNN** (Chemistry Department, Southern Oregon University, Ashland, OR).

ECOLOGY and ENVIRONMENTAL SCIENCES

(9) *Adaptive Searching in Spatially-Structured Systems: Applications from Microbial Ecology to Biodefense,* **GUY R. KNUDSEN[1] and JAMES P. STACK[2]** ([1]Soil and Land Resources Division, University of Idaho, Moscow, ID; [2]Department of Plant Pathology, Kansas State University, Manhattan, KS).

HEALTH SCIENCES

(20) *Complex Regional Pain Syndrome-I of the Lower Extremity in Patients with Diabetes Mellitus,* **STEPHEN J. MOREWITZ*, GRAHAM P. SHAW, JOEL R. CLARK and TREY MATHENY** (Department of Podiatric Medicine, California School of Podiatric Medicine, Samuel Merritt College, Oakland, CA; Barry University, Miami Shores, FL; Stephen J. Morewitz, Ph.D., & Associates, CA & IL, San Francisco, CA).

(21) *Possible Marital Status and Age Differences in Arthritis Impairment*, **STEPHEN J. MOREWITZ** (Department of Public Affairs & Administration, Health Care Administration Program, California State University, Hayward, CA, and Research Division, Stephen J. Morewitz, Ph.D., & Associates, CA & IL, San Francisco, CA).

(22) *Immortal Athletes: A Study of the Lifespan of World Class Athletes,* **AMANDA C. JOHNSTON** (Livermore High School, Livermore, CA).

PSYCHOLOGY

(23) *Cognitive Mathematics: Using the Brain's Innate Abilities for Mathematical Understanding,* **SUZANNE FARNSWORTH** (Department of Psychology, Southern Oregon University, Ashland, OR).

(24) *Compliance of Hand-Washing Behavior in Regard to Gender when Prompted with a Sign,* **CAROL HIBNER** (Psychology Department, Southern Oregon University, Ashland, OR).

(25) *The Psychology of Signage for Long Term Radiological Storage Facilities,* **STUART DAVIS** (C/O James Wise, Department of Psychology, Washington State University – Tri-Cities, Richland, WA).

(26) *Children's Early Socialization Experiences in Urban Coffeehouse,* **DEBORAH ANN SHOEMAKER** (Washington State University – Tri-Cities, Richland, WA).

(27) *Racial and Ethnic Differences among Offenders who Sexually Assault or Rape Their Intimate and Non-Intimate Partners,* **STEPHEN J. MOREWITZ** (Research Division, Stephen J. Morewitz, Ph.D., & Associates, CA & IL, San Francisco, CA).

PHYSICS

(32) *Synthesizing Polymerizable Lipids for Use in Stabilized Vesicles,* **VIRGINIA D. BERUBE* and SCOTT M. REED (**Department of Chemistry, Portland State University, Portland, OR).

(33) *Coupling Porphyrin Photosensitizers to Metal Nanoparticles through Oligonucleotide Linkers,* **AOIFE M. O'BRIEN*, DENEIL BRAGG, BAHAREH HABIBI, SAYMORE MUTSAMWIRA, HIEU PHUNG, SARITA SITAULA, JOSH WILLIAMS, and SCOTT M. REED** (Portland State University, Department of Chemistry, Portland, OR).

(34) *X-ray Powder Diffraction to Demonstrate Doping of Zinc Oxide with Manganese and Copper,* **LORI NOICE[1*], JUSTIN HIBBART[1], GIRISH UPRETI[1], BJOERN SEIPEL[1], PETER MOECK[1], AMITA GUPTA[2] and K. VENKAT RAO[2]** ([1]Department of Physics, Portland State University, Portland, OR; [2]Department of Materials Science, Tmfy-MSE, The Royal Institute of Technology, Stockholm, Sweden).

(35) *Birefringence and Light Scattering Measurements in a Wormlike Micellar System,* **COREY HOVEN[1*], PANOS PHOTINOS[1], MARIA R. LOPEZ-GONZALEZ[2], and PAUL T. CALLAGHAN[2]** ([1]Department of Physics and Engineering, Southern Oregon University, Ashland, OR; [2]MacDiarmid Institute for Advanced Materials and Nanotechnology, School of Chemical and Physical Science, Victoria University of Wellington, New Zealand).

(36) *Efforts toward the Preparation of $(Sb_2Te_3)_x(TiTe_2)_y$ Superlattices,* **BENJAMIN A. SCHMID*, CLAY D. MORTENSEN, RAIMAR ROSTEK, and DAVID C. JOHNSON** (Department of Chemistry and Materials Science Institute, University of Oregon, Eugene, OR).

(37) *An Annealing Study of $(Bi_2Te_3)_x(TiTe_2)_y$ Superlattices,* **MARY SMELLER*, STACEY STANDRIDGE, and DAVID C. JOHNSON** (Department of Chemistry and

Materials Science Institute, University of Oregon, Eugene, OR).

(38) *Ferroelectric Behavior of $YMnO_3$,* **JASON MATTHEWS*, MICHAEL ANDRUS, PETER WU, PANOS PHOTINOS and SIDNEY C. ABRAHAMS** (Department of Physics and Engineering, Southern Oregon University, Ashland, OR).

(39) *The Physics of Meanders – From Ribbons To Rivers,* **RICHARD S. BENSON** (Department of Physics, Southern Oregon University, Ashland, OR).

WESTERN SOCIETY of SOIL SCIENCE

(10) *Changes to Soil Chemistry by Application of Fruit Processing Liquids and Solids,* **MITCHELL JOHNS** (Plant and Soil Science, California State University, Chico, CA).

(11) *Long-term Tillage and Nitrogen Fertilization Impact on Soil Microbial Biomass,* **J. E. MATOCHA** (Texas Agricultural Experimental Station, Texas A&M University, Corpus Christi, TX).

(12) *Amino-G: Miracle Tracer . . . Conservative, High Solubility, Low Detectability, and Now, Reversible Signal Suppression at Low pH!!!* **JAMES R. CASSIDY, JOHN E. BAHAM, and MARIA I. DRAGILA** (Department of Crop & Soil Science, Oregon State University, Corvallis, OR).

(13) *Speciation of Pb, Zn, As, and Cd in Soils Developed on the Coeur d'Alene River Floodplain,* **PATRICK HICKEY and DANIEL G. STRAWN** (Soil and Land Resources Division, University of Idaho, Moscow, ID).

(14) *Predicting Soil Properties with Solar Radiation Models: An Alternative to Aspect,* **D.E. BEAUDETTE and A.T. O'GEEN** (Land, Air and Water Resources, University of California, Davis, Davis, CA).

(15) *Spatial Data Mining and Soil-landscape Modeling Applied to Soil Survey,* **ABELHAMID A. ELNAGGAR[1], JAY S. NOLLER[1] and MARK KELLER[2]** ([1]Department of Crop and Soil Science, Oregon State University, Corvallis, OR; [2]Natural Resources Conservation Service, Hines Service Center, Hines, OR).

(16) *Using GIS and Fuzzy Rule Sets for Pre-mapping Soils: The Dustbowl Quadrangle Project, Central Oregon,* **SHEILA SLEVIN, ED HORN and JAY S. NOLLER** (Department of Crop and Soil Science, Oregon State University, Corvallis, OR).

(17) *Using the Natural Abundance Method to Determine Biological Nitrogen Fixation by Legume Cover Crops,* **JODI J. WINEMILLER, KATIE L. MONSEN, and CAROL SHENNAN** (Center for Agroecology and Sustainable Food Systems, University of California Santa Cruz, Santa Cruz, CA).

(18) *Mineralogical Characterization of Seasonally Submerged Wetland Soils,* **N. BRAUER, J.J. MAYNARD, R.A. DAHLGREN, and A.T. O'GEEN** (Land, Air and Water Resources, University of California Davis, Davis, CA).

(19) *Serpentine and Nonserpentine Accessions of* Achillea millefolium *Differ in Their Tolerance of Serpentine Substrates and Response to Amendment,* **RYAN E. O'DELL and VICTOR P. CLAASSEN** (Department of Land, Air, and Water Resources, University of California Davis, Davis, CA).

notes

ABSTRACTS

Abstracts are listed in alphabetical order by first author.
Not all authors submitted an abstract.

Erosion Hazard Potential in Laramie River Basin, **RIFAT AKIS, LARRY C. MUNN, and J. MICHAEL DANIELS** (Soil Science, Renewable Resources, College of Agriculture, University of Wyoming, Laramie, WY 82071; E-mail: akis@uwyo.edu).

In the Laramie River Basin, soil erosion is a significant contributor to land degradation, the rate of which depends on a series of interconnected factors. In-depth mapping of soil erosion potential hazard and land capability are needed to understand and improve soil management strategies in the basin. The aim of this research is to evaluate potential soil erosion hazard in the watershed. Study objectives include predicting potential erosion hazard in the basin soil series and investigation of relations among erosion factors and watershed morphometry under different land management scenarios. This study integrates revised universal soil loss equation (RUSLE) into ArcGIS to quantify and map erosion hazard. Data sets for RUSLE were produced using ArcGIS, ArcInfo Grid and ArcInfo Macro language (AML) tools. Results indicated that the basin was 7th order if 111 cells contributed to flow for a channel to occur. If flow contributing areas increase to 7500 cells for a channel formation, the shape of the basin changes dramatically due to severe erosion and the basin becomes 5th order. RUSLE parameters indicate significant negative correlations with soil physical properties. Geospatial analyses revealed soil saturated hydraulic conductivity (Ks) and soil erodibility factor (K) cross-correlated for basin's flood plains and non-flood plain soils under different land use practices. This analysis allows identification of appropriate soil and water conservation practices to reduce erosion risk potential in the basin.

Serpentine Soils and Vegetation from Alaska to Baja, **EARL B. ALEXANDER** (Soils and Geoecology, 1714 Kasba Street, Concord, CA 94518; E-mail: earlbalexander@cs.com).

Nearly all of the ultramafic rocks, or "serpentine", in western North America are in accreted terranes. Accreted terranes are lands that formed far from the continent and drifted on allochthonous plates to the continent where they were attached onto it. These accreted terranes are in the Brooks Range and southward between the northern Rocky Mountains and the ocean to the northern Cascade Mountains, in the Blue Mountains, the Sierra Nevada, the Klamath Mountains, the California Coast Ranges, and Baja California. All orders of the U.S. Soil taxonomy are represented by soils in these terranes, but there are no serpentine Andisols. At the north, frozen serpentine soils (Gelisols) with tundra vegetation are presumed to occur in the western Brooks Range, but none have been described on serpentine. South from the Brooks Range to the Northern Cascade Mountains, slightly developed cold and very cold serpentine soils (Inceptisols) with forest and tundra vegetation are dominant on serpentine. From the Blue Mountains south to Baja California, most of the serpentine soils that are not very cold have subsoil horizons with clay accumulation (argillic horizons). Many are humified soils (Mollisols) with cold juniper woodland, cool open pine forest, warm chaparral, and warm grassland. Many are cold to cool, slightly leached soils (Alfisols) with open pine forest. Some are cool, highly leached soils (Ultisols) with conifer forest. And some are warm cracking-clay soils (Vertisols) with grassland. In the hot deserts of Baja California some serpentine soils have argillic horizons (Aridisols) and some do not (Entisols).

Landbird Species Diversity in the Cascade-Siskiyou National Monument, as Compared with Crater Lake National Park and Whiskeytown National Recreation Area, **JOHN D. ALEXANDER[1], NAT SEAVY[1,2], DANIEL A. SARR[3], and PAUL E. HOSTEN[4]** ([1]Klamath Bird Observatory, P.O. Box 758, Ashland, OR 97520; E-mail: jda@KlamathBird.org; [2]University of Florida, Department of Zoology, Gainseville, FL 32611; E-mail nes@KlamathBird.org; [3]Klamath Network-National Park Service, 1250 Siskiyou Blvd., Ashland, OR 97520-5011; E-mail: Daniel.Sarr@orst.edu; and [4]Bureau of Land Management, Medford District, 3040 Biddle Road, Medford, OR 97504; E-mail: Paul_Hosten@blm.gov).

The factors influencing bird communities operate across multiple spatial scales. The local associations of species with particular vegetation types or successional stages are superimposed upon larger scale distribution patterns governed by landscape-scale drivers, such as climate. In this study, we explore patterns of climate, habitat heterogeneity, and bird distribution and diversity in three regional conservation preserves: (1) Crater Lake National Park; (2) Cascade-Siskiyou National Monument, and (3) Whiskeytown National Recreation Area. Our results suggest that climate and habitat heterogeneity may be important in structuring bird communities at the landscape scale. Bird species richness in the Monument is greater than species richness at Crater Lake, despite the Park's large expanse of relatively pristine forest, lake, and meadow habitat. Species richness in the Monument is apparently as great as richness at Whiskeytown despite the Monument's considerably cooler climate. These patterns may be due to compensation by the relatively greater habitat heterogeneity in the Monument.

Bird Monitoring and Inventory in Crater Lake National Park, **JOHN D. ALEXANDER[1], JAIME L. STEPHENS[1], NATHANIEL E. SEAVY[1], and DANIEL A. SARR[2]** ([1]Klamath Bird Observatory, PO Box 758, Ashland, OR 97520; [2]Klamath Network - National Park Service, 1250 Siskiyou Blvd., Ashland, OR 97520-5011; E-mail: jda@KlamathBird.org).

During 2002-2003, in partnership with the National Park Service Klamath Network, the Klamath Bird Observatory (KBO) took part in efforts to inventory landbirds at Crater Lake National Park. We established bird monitoring stations where we conducted avian inventories using standard sampling methods during both the breeding (May-June) and fall dispersal and migration (September-October) seasons. We also identified additional information that was available from previous bird monitoring efforts conducted within the park. The use of multiple standardized monitoring methods for inventorying and monitoring birds is critical for the effectiveness of inventory and monitoring programs. Point count censuses proved to be an efficient tool for inventorying many species during the breeding season, however the use of mist nets greatly augmented the effort by sampling species that are inadequately detected using point counts and providing demographic data. Additionally, devoting resources towards inventorying birds during the fall provided information about species that occur in the park during migration and wintering seasons when area search census and mist-netting techniques are more effective than point counts. Data from previous bird monitoring efforts in the park that had been archived by the Klamath Demographic Monitoring Network augmented our inventory efforts demonstrating the importance of cooperative regionally based monitoring efforts.

Thermal Dependence of $K_2Cr_2O_7$ Structure through the Phase II-to-Phase I Transition, **MICHAEL ANDRUS, JASON MATTHEWS, PETER WU, PANOS PHOTINOS and SIDNEY C. ABRAHAMS** (Department of Physics and Engineering, Southern Oregon University, Ashland, OR 97520; E-mail: michaelw@andruslaser.com).

We have previously shown that dry $K_2Cr_2O_7$ crystals of phase II with space group $P\bar{1}$ undergo a first-order transition to phase I with space group $P2_1/n$ at T_{PT} = 531(2) K on heating. The phase transition on cooling is at 502(2) K. Crystals grown from water solution have T_{PT} = 544(2) K on first heating, an increase caused by the pressure of superheated water occupying inclusion defects. This transition has been studied and speculated upon inconclusively since 1908. We now report the thermal dependence of the K^+ and $Cr_2O_7^{2-}$ ion arrangement by profile analysis of the powder diffraction pattern determined at a series of temperatures through the transition from phase II to phase I and discuss the large rotations of the anion as symmetry elements are gained on heating or lost on cooling at the phase transition.

Research supported by the National Science Foundation, grant DMR-0137323.

Isolation of Zinc Resistance Genes from Serratia proteamaculans *by mRNA Subtractive Hybridization,* **MICHAEL BATES, TARA WOLFLEY, TRISHA KRUEGER, TAYLOR UPDEGROVE and DONALD LIGHTFOOT** (Department of Biology, Eastern Washington University, Cheney, WA 99004; E-mail: dlightfoot@mail.ewu.edu and mbates80@mail.students.ewu.edu).

Mining and smelting since 1885 in the Silver Valley Idaho have left the riparian sediments polluted with heavy metals from the South Fork of the Coeur d'Alene River west to Long Lake. Sediment sampling has shown total zinc concentrations of 100mM, with water soluble concentrations of 0.12mM (Siegel, 2000). Bacterial nutrient agar amended with 5mM $ZnSO_4$, was inoculated with bacteria from these soils and supported growth of *Serratia proteamaculans* only. In an electrolytic bioreactor, at greater than 50mM zinc ion concentrations, *S. proteamaculans* grows well (Knapp, 2004). *S. proteamaculans* requires a slow increase in zinc ion concentrations to survive and will not grow if initially introduced into greater than 15mM zinc ions (Knapp, 2004). Bacteria grown under high zinc conditions vary from low zinc bacteria only by those mRNAs responsible for zinc resistance. Induction of zinc resistance was exploited by the construction of a unique mRNA subtractive hybridization protocol to isolate the genes responsible. The method includes: 1) efficient total RNA extraction, 2) removal of rRNA, 3) conversion of mRNA to double stranded copy-DNA (cDNA), 4) addition of known adapter sets to unique cDNAs, 5) hybridization of induced and un-induced cDNAs such that sequence common to both cDNAs are refractory to PCR, 6) PCR amplification of the unique cDNAs and 7) cloning and sequencing of amplified resistance cDNAs. Understanding the structure of zinc resistance genes from *Serratia proteamaculans* is key to possible use of this organism in addressing toxic levels of zinc in the environment and implementation in bio-remediation.

Predicting Soil Properties with Solar Radiation Models: An Alternative to Aspect, **D.E. BEAUDETTE and A.T. O'GEEN** (Land, Air and Water Resources, University of California, Davis, One Shields Avenue, Davis, Ca 95616; E-mail: debeaudette@ucdavis.edu).

Aspect angle is commonly used by soil scientists as a proxy for the variation in solar radiation across landscapes. It is common practice to generalize aspect angle even further to the notion of "cool" and "hot" slopes when mapping soils. With the abundance of high-resolution digital elevation models and climatic data, it is now possible to model numerical values that had previously been estimated by aspect angle. Solar radiation models, such as SRAD and SOLPOS, can

numerically model the components of a solar radiation budget at each cell of a digital elevation model. Numerous settings allow for site-specific calibration of climatic parameters, vegetation coverage, and surface albedo. Preliminary work at the Pinnacles National Monument suggests that mean annual solar radiation values on north and south aspects can differ by as much as two-fold. Furthermore, solar radiation values varied up to four-fold more on north slopes as compared to south slopes. Data of this nature may be of initial value in classifying regions of similar "solar profiles", based on pre-defined thresholds. In this study, we propose that estimated solar radiation values are most useful when used as an input into external, process-based, models that predict pedogenic and climatic properties. To do so, various empirical and thermodynamic relationships will be linked to modeled solar radiation data, as an initial exploration of their utility in predicting soil properties. Future work will incorporate our findings into a regional project which integrates various process-based models into a unified, energy flux approach to modeling pedogenesis.

Isolation, Identification and Characterization of Wine Yeasts, **CHANDA BEEGHLEY and KATHLEEN A. PAGE** (Southern Oregon University, Dept. of Biology, 1250 Siskiyou Blvd., Ashland, OR 97520; E-mail: Beeghlech@students.sou.edu and page@sou.edu).

Subtle differences between strains of *Saccharomyces cerevisiae* used in grape fermentation can alter essential characteristics of the wine produced. Resident wild yeast that colonize fermentation cultures often have characteristics that improve wine quality. Two yeast strains were isolated from Weisinger's winery in Ashland, Oregon. One was the commercially available strain, *S. cerevisiae* D-254, that was purposefully used for fermentation and the other was a resident wild yeast, termed RY, that colonized grape juice for fermentation. The two strains were characterized using traditional microbiologic techniques and by sequencing the 5.8S rRNA intergenic transcribed spacer (ITS) region. Results showed that the resident wild yeast RY was a strain of *S. cerevisiae* closely related to, but not identical to *S. cerevisiae* D-254 and other wine yeast strains.

The Physics of Meanders – From Ribbons To Rivers, **RICHARD S. BENSON** (Department of Physics, Southern Oregon University, 1250 Siskiyou Boulevard, Ashland, OR 97520; E-mail: bensonr@sou.edu).

It has long been recognized that rivers will naturally follow curving paths as they make their way to the oceans. Numerous phenomenological models (Leopold, & Wolman, 1957, Johnson 2005) have been developed to characterize these systems with remarkable success in replicating many features. In this paper the author describes a method of deriving a model of meanders based on simple physical principles and explores the results of variations in the fundamental physical parameters.

Relativity in Science-Fiction: the Einsteinian Kurt Vonnegut, **MATT BERNSTEIN** (California State University, Northridge, Northridge, CA, 91330; E-mail: Rovingeye8@aol.com).

So it grows.

As Kurt Vonnegut evolved from pulp science-fiction to the coveted realm of high literature, the Vonnegut cosmos evolved as well. Jettisoning the Newtonian model of the universe, the Vonnegut embraces Einsteinian notions of relativity, creating a model of the universe that functions as a Heisenbergian nightmare—where everything is uncertain, from the opening sentence to the final *poo-tee-weet*. Scientifically educated, Vonnegut charges his novels with a force very few science-fictions can replicate: actual scientific knowledge. The Schrödinger's Cat quandary, space/time relativity, atmosphere on Titan—each mystery melts away and is explained with childlike simplicity. As Edgar Allen Poe correctly solved one of the greatest cosmological mysteries of the Eighteenth-Century—deciphering that the reason the night sky, though filled with an infinite amount of stars, is not filled with an infinite blanket of white light is because the starlight has not yet reached Earth—Vonnegut exploits the Nineteenth-Century cosmological mysteries. His treatment of such is both clarifying and confusing. He constantly expands the notions of relativity so that everything his characters touch, including the characters themselves, becomes relative. Essentially (if anything truly *has* an essence in the Vonnegut cosmos), his knowledge of science grants him the power to break the rules of science and tinker with the universe to his own ends. Utilizing a number of sources, both literary and scientific, my paper aims to show how Vonnegut bridges the gap between literature and science.

Synthesizing Polymerizable Lipids for Use in Stabilized Vesicles, **VIRGINIA D. BERUBE and SCOTT M. REED (**Department of Chemistry, Portland State University, Portland, OR 97207; Serendipity960@Hotmail.com or SReed@Pdx.edu).

The precise delivery and timed release of pharmaceuticals requires their encapsulation in containers that are resilient to physiological conditions. While conventional vesicles have been used to encapsulate drugs and to target specific tissue types, they are not able to provide the necessary stability or the triggered release of their contents. Polymerizable lipids are being explored as a solution. The use of a polymerizable moiety allows the vesicles to be cross-linked, providing added stability and control over the timed release of their contents. A three stage synthetic route to a novel class of polymerizable lipids will be presented.

This class of polymerizable lipids includes three components: tail groups that are hydrophobic and polymerizable, a charged head group, and a hydrophilic, triethylene glycol-containing linker. Progress towards the completion of the overall synthesis including the coupling of a dienoic group to a long-chain alkanediol to form the polymerizable tail group will be reported. In addition, the synthesis of a heterobifunctional triethylene glycol spacer terminating with a carboxylic acid has been completed. Progress on the coupling of the tail groups to the linker and the preparation of the charged head group through functional group transformations is ongoing.

Whose Situation Is It Anyway? **GAUTAM BHATTACHARYYA** (Department of Chemistry, University of Oregon, Eugene, OR).

In recent years, much effort has been placed in designing situated learning environments in hopes of stimulating student interest and learning with "real-life" applications of chemical concepts and principles. We recently completed a study in which we investigated how organic chemistry graduate students solve organic synthesis problems. One of our primary discoveries in this study is that the participants' ability to use the heuristics of organic chemistry was related to their perception of the task as "real." This presentation will present some of the data from that study, propose a theoretical basis for why this evolution occurred, and provide some implications for the teaching of sophomore-level organic chemistry.

Creating Student Interest in Science: A Design-Build Project for a Personal, Portable Water Purification System, **HEATHER N. BISCHEL and STEPHEN P. ANDREWS, JR.** (Environmental Sciences Teaching Program, University of California, Berkeley, 301 Campbell Hall, Berkeley, CA 94720, E-mail: hbischel@berkeley.edu).

The Environmental Sciences Teaching Program (ESTP) CalSci Academy uses project-based curriculum with an emphasis on practical applications to increase students' interest in science. During the spring of 2005, students focused on creating portable water filters designed for use in emergency situations like post-tsunami Indonesia. Lack of access to safe drinking water affects millions of people throughout the world and is an important issue for students to address. Through the course of a nine-session weekend program, San Francisco Bay Area high school students learned about the challenges of building a personal, portable water purification system. First, students dismantled current popular filters on the market. They employed library and Internet research skills in order to develop an initial design. Undergraduate students gave relevant lectures on topics including water and wastewater treatment processes as well as other treatment technologies. These lectures were coupled with discussions of chemical and physical properties of water that influence the unique role of water in our lives. The program allowed for the integration of basic sciences (biology, chemistry, and physics) with the hope that an interdisciplinary approach would increase science interest in the students' normal high school classes. Students gained first-hand experience in the problems and obstacles that real-life engineers face in designing new products by designing, building, testing, and presenting a small scale water treatment device.

Hemoglobin Catastrophe, Implication for Clinical Diagnostic and Cooperative Binding, **DAVID BLACKMAN** (University of California (retired), Berkeley, CA and Albert Schweitzer International University; mailing address: 307 W 2nd St., Phoenix, OR 97535-7733).

Chaos and Catastrophe analysis of the cooperative binding saturation curve is rich in nuance. Bifurcation diagrams for cooperative binding enzymes exhibit catastrophe points. The catastrophe point for hemoglobin correlates within 1% error to the apparent loss of oxygen binding. As Hill constant, (p), varies the catastrophe point migrates from unity to a low at 0.5 and then back to unity. For myoglobin, p=1, implying non-cooperative binding. In the limit, the attracting fixed point at zero and unity are equilibrium points. The most unstable configuration is where p=2 and the derivatives there are maximal. Hemoglobin has a p=2.8 and it has unstable fixed points, apparently desirable characteristic in transport enzymes. The curve for carboxyl-hemoglobin resembles myoglobin more than hemoglobin. Apparently CO disrupts cooperative binding. Diagnosis of CO toxicity uses a Breathalyzer without knowledge of the blood gases, given the tendency for acute respiratory to convert to compensated acidosis, this is likely insufficient information. CO-Hemoglobin binding equilibrium should be influenced by both pH and pCO_2. Theory indicates use of CO_2 with oxygen might help with CO detoxification. The Hill constant speaks volumes about the nature of the cooperative binding enzyme. A low p value implies weak binding. Values close to 2 are transient in nature. System with high p, are strong binders. Oxygen-myoglobin < oxygen-hemoglobin < taxol- microtubule < many neuroactive drugs-dopamine/serotonin receptors.

Thermodynamic Elements of the Myocyte, **DAVID BLACKMAN** (University of California (retired), Berkeley, CA and Albert Schweitzer International University; mailing address: 307 W 2nd St., Phoenix. OR 97535-7733).

Myocyte modeling presently falls into three camps: electro-physiologist, channel counting and characterization; electrical engineers or wave form analysis; and chaos theorist interested in calcium bursting. All of these approaches are doomed because of a failure to analyze the energy flow or thermodynamic relationship between the currents. There are three important currents in myocyte function: sodium/calcium

exchange, passive potassium leakage and active transport. The thermodynamics of the sodium/calcium exchanger demonstrates a toggling of the contractile event by the polarization event. Thermodynamics of the passive potassium current demonstrates the potassium gradient critical to the amplitude timing of the polarization event. Kinetics and equilibrium considerations of active transport are used to demonstrate active transport can substitute for passive transport. As shown two years ago, this is experientially possible. Myocytes are two trick ponies and the analysis is simple. Thermodynamic analysis indicating that channel currents are intrinsically tied together and one cannot simply count channels affects the study of their kinetics and understanding of the myocyte. The key to understanding the myocyte is to understand the link between polarization and contractual events. Polarization toggles contraction and is controlled in turn by the gradient forces in the Hamiltonian Fermi distribution. Passive polarizing current flow occurs if and only if there is a difference between the Nernst potential and the membrane potential. The role of active transport is to supplement for and if necessary substitute for passive transport. The substitution part is the key to solving the arrhythmia problem. Best evidence shows substitution is possible.

Protocol Development, for Soil Survey Updates at Golden Spike National Historic Site, **JEDD M. BODILY and JANIS L. BOETTINGER** (Utah State University, Department of Plants, Soils, and Biometeorology, 4820 Old Main Hill, Logan, UT 84322-4820; E-mail:jeddmbod@cc.usu.edu).

The Natural Resources Conservation Service (NRCS) has few guidelines for soil survey update procedures. However, the use of geographical information systems (GIS), spatially explicit topographic and remote sensing data would help to expedite, as well as improve, the soil survey update process. The Golden Spike National Historic Site (GOSP) was chosen as a site at which to develop soil survey update protocol using spatially explicit data in a GIS. Ten-meter digital elevation models (DEM) and GIS were used to calculate slopes across the landscape. Two slope analyses were performed, one as a broad, informative analysis of map units across the entire soil survey, and another as a specific slope calculator by map unit within the GOSP. Slope was measured in the field in selected polygons of map units and compared to DEM-derived slope. The slope of most map units were accurately predicted using DEM while map units belonging to steep-sided drainages were not. Limestone rock outcrop was identified using Landsat 7 Thematic Mapper imagery. A model using threshold values of a normalized spectral index, a fractional vegetation index, and slope yielded 87% overall accuracy. Rock outcrop percentage and area was determined for map units. Ecological sites for map unit interpretations were refined using an unsupervised classification of Landsat 7 imagery. Twelve vegetation classes were clumped down to three classes using prior landscape knowledge and class specific spectral signatures. Class percentages within map units determined the final ecological site classification.

Transition from Undergraduate to Graduate Studies: How Will My Nobel-Prize Winning Research Be Funded and By Whom? **CHRISTOPHER J. BORMAN** (Department of Chemistry, Dept. 3838, 1000 E. University Ave., Laramie, WY 82071).

The transition to graduate school in the sciences can be an arduous task; however, the NSF-REU program facilitates this process. But being enrolled in a graduate program does not alleviate the seemingly perpetual funding issues associated with how you pay the bills. Personal experience with the REU program, matriculation to, and continuation of a graduate program in chemistry will be discussed along with an introduction to research leading to a PhD dissertation.

Hyperaccumulation: Plant Defense and Food Web Consequences, **ROBERT S. BOYD** (Department of Biological Sciences, Auburn University, AL 36849-5407; E-mail: boydrob@auburn.edu).

Recent studies have explored some of food web consequences of hyperaccumulation by plants. Hyperaccumulation poisons or deters some herbivores but others are able to circumvent these plant elemental defenses. The defensive effectiveness of hyperaccumulated elements depends on the element, the feeding mode of the herbivore, and the evolution of herbivore tolerance for the element. As examples of elemental tolerance, field surveys of Ni hyperaccumulators in California, New Caledonia, and South Africa have identified at least 10 insect taxa that feed on Ni hyperaccumulator tissues and themselves contain >500 micrograms Ni/g. These high Ni insects mobilize metals into local food webs of the communities that contain hyperaccumulator plants. It has been hypothesized that Ni in these insects may defend them against their predators and pathogens. However, initial tests using the high Ni insect, *Melanotrichus boydi* (Heteroptera: Miridae), have shown a defensive effect against only one of the predators and pathogens tested. Further research, especially using very high Ni (up to 3,500 micrograms Ni/g) insects recently discovered from South Africa, is warranted to more completely explore the effects of hyperaccumulated Ni on higher trophic levels.

Mineralogical Characterization of Seasonally Submerged Wetland Soils, **N. BRAUER, J.J. MAYNARD, R.A. DAHLGREN, and A.T. O'GEEN** (Land, Air and Water Resources, University of California Davis, One Shields Avenue, Davis, CA 95616; E-mail: nebrauer@ucdavis.edu).

This study is part of a larger project that is evaluating the efficacy of constructed wetlands (CW) to improve water quality in agricultural return flows ultimately destined for the San Joaquin River. Mineralogy of seasonally submerged soils

was characterized in a 10-yr-old CW in order to obtain a better understanding of the fate of contaminants. Water quality monitoring at input and output locations indicate that CWs were efficient at removing particulate organic carbon, sediment and phosphorous. The CW was most effective at removing suspended sediment with an average removal efficiency of 97%. Average particulate organic carbon retention, indicated by volatile suspended solids, was 75%. Average P removal efficiency was 71%, after an initial release of P due to establishment of reducing conditions in the wetland sediments. The fate of P removed from the water column is not known. To gain insight on mechanisms of P removal, we characterized sediment collected from over 50 deposition plates in the wetland during the 2004 irrigation season. Selective dissolution was used to measure crystalline and poorly crystalline iron- and manganese-oxides. Dithionite-citrate extractable Fe ranged from 6 to 18 g/kg. Acid oxalate extractable Fe ranged from 0.09 to 0.53 g/kg. In both instances, extractable Fe was highest in areas near output and input locations and lowest in the middle of the wetland. Olsen-P tests will be performed to measure available P. This information will be coupled with organic carbon, C:N, total P and texture data to document how soil properties in CWs influence P storage.

An Alternative Theory of Intelligent Design, **TERRY BRISTOL** (Institute for Science, Engineering and Public Policy, 3941 SE Hawthorne Blvd, Portland OR 97214; E-mail: bristol@isepp.org).

The Intelligent Design Hypothesis that the universe is governed by an intelligence has a long and credible history. Re-introducing the historic theories enhances the modern debate. Empedocles, responding to the early scientific theories, introduced an historical model of the life (the universe) involving the concept of chance variation of biological forms as well as the concept of natural selection operating on that variation. Anaxagoras countered that the world is governed by an intelligence (nous). Socrates found this interesting but inadequately developed. Socrates then questions whether the universe might be an emerging intelligence. The Socratic framework is a cornerstone of much of Western Civilization. I argue for modern correlates. Darwin responds to time-symmetric Newtonian science by proposing "a slightly heretical" net historical sequence, specifically the evolution of life, that proceeds developmentally through a process of chance variation and natural selection.

Gould captures the contingency of the Darwinian, chance-governed process in Wonderful Life. Conway Morris counters, in Life's Solution: Inevitable Humans in a Lonely Universe, that the providential design solutions embodied in living forms are inevitable. I argue that from an engineering perspective both life's historical processes and resultant design (viz. structure and function) broadly support the Intelligent Design Hypothesis. Searching for compatibility, I argue for a deep link between Empedocles "chance variation", Darwin's "blind variation" and the otherwise curious Socratic "dialectic" where, although challenging the answers offered by others, he is unable (viz. as if blind) to offer answers of his own.

The Heraclitean Aspect of the Second Law, **TERRY BRISTOL** (Institute for Science, Engineering and Public Policy 3941 SE Hawthorne Blvd, Portland OR 97214).

The First Aspect of the Second Law is that differences in energy distribution tend to sameness or uniformity. Columbia's Brian Greene, in Fabric of the Cosmos, suggests a low entropy beginning. This highly differentiated, asymmetric beginning then tends irreversibly toward uniformity; symmetry. A troubling residual problem is the origin of these differences that tend to sameness. The astronomically observed differentiation must also be ubiquitous in space-time. The Second, Heraclitean Aspect of the Second Law is that energy-transfer, where work is performed, always, inefficiently, produces a heat loss. If the Second Law says anything meaningful it is that the work-transfer and the heat loss are essentially incommensurable - non-linearly related processes. I argue that this Second, Heraclitean Aspect of the Second Law is the ubiquitous source of differentiation in the universe. This "obvious" solution - perhaps to a number of fundamental problems in modern physics - remains under-appreciated by the scientific community because it entails time-asymmetry. Sang Wook Yi's recent challenge (Philos Science, 70, 1028) of Sklar's (Physics and Chance) standard account of the reduction of classical thermodynamics to statistical mechanics, and David Albert's arguments in Time and Chance support my arguments that the origin of differences - as well as the ongoing creation of new differences - in the universe is a natural expectation of the Second, Heraclitean Aspect of the Second Law. These arguments push us away from the time-symmetric models of modern physics toward a fundamentally thermodynamic model of the universe. Following Yi I argue that these models are'"competitive and compatible".

Assessing Stratified Soil Acidity in Inland Northwest Direct-Seed Cropping Systems, **TABITHA T. BROWN, RICHARD T. KOENIG, DAVID R. HUGGINS, JAMES B. HARSH, and RICHARD E. ROSSI** (Crop and Soil Sciences Department, Washington State University, Johnson Hall 201, Pullman, WA 99164-6420; E-mail: tabitha_brown@wsu.edu).

Declining soil pH is detrimental to cereal and grain legume production in the Inland Pacific Northwest (IPNW). Direct-seed (DS) systems are characterized by the development of stratified soil acidity at the depth of fertilizer placement. It has yet to be determined how acidity moves through the soil profile or how broadcast or subsurface-banded lime strategies can influence soil acidification in DS systems

of the IPNW. This study is focused on characterizing stratification of soil acidity and the Al chemistry in the seed-zone environment of a DS system. Detailed sampling using a 60 by 30 cm grid and the Visual MINTEQ chemical speciation program were used to assess the spatial variability of soil acidity and Al speciation in treatments consisting of subsurface-banded lime, broadcast lime or broadcast sulfur. The zone of greatest acidification (5 to 10 cm) was associated with the zone of fertilizer placement. Acidification of the upper 20 cm of soil indicates that soil acidity may be moving vertically with repeated fertilizer application. Based on crop tolerances and the trend of declining soil pH, liming programs may be necessary in the future to maintain crop yields and soil quality in DS. Preliminary exchangeable Al data, using a 1 *M* KCl extract, indicates differences in Al concentration with depth and treatment. For all treatments except the broadcast sulfur, the highest extractable Al concentration occurred in the zone where both the fertilizer and seed are placed. Aluminum speciation data will be presented to describe Al complexation by treatment and depth.

Natural Variability of Fish Population Dynamics in a Lake with no Manipulative Management, **MARK BUKTENICA[1], SCOTT GIRDNER[1], GARY LARSON[2] and C. DAVID McINTIRE[3]** ([1]Crater Lake National Park, PO Box 7, Crater Lake, OR 97604; [2]USGS, Forest and Rangeland Ecosystem Science Center, 777 NW 9th Street, Suite 400, Corvallis, OR 97330; [3]Department of Botany and Plant Pathology, Oregon State University, Corvallis, OR 97331; E-mail: mark_buktenica@nps.gov).

Crater Lake is a unique environment to evaluate the ecology of introduced kokanee and rainbow trout because of its otherwise pristine state, low productivity, absence of manipulative management, and lack of lotic systems for fish spawning. Between 1986 and 2004, kokanee displayed a great deal of variation in population demographics with a pattern that reoccurred in about 10 years. We believe that the reoccurring pattern resulted from density dependent growth, and associated changes in reproduction and abundance, driven by prey resource limitation that resulted from low lake productivity exacerbated by prey consumption when kokanee were abundant. Kokanee fed primarily on small-bodied prey from the mid-water column; whereas rainbow trout fed on large-bodied prey from the benthos and lake surface. Cladoceran zooplankton abundance may be regulated by kokanee. And kokanee growth and reproductive success may be influenced by the availability of *Daphnia pulicaria*, which was absent in zooplankton samples collected annually from 1990 to 1995, and after 1999. Distribution and diel migration of kokanee varied over the duration of the study and appeared to be most closely associated with prey availability, maximization of bioenergetic efficiency, and fish density. Rainbow trout were less abundant than were kokanee and exhibited less variation in population demographics, distribution, and food habits. There is some evidence that the population dynamics of rainbow trout were in-part related to the availability of kokanee as prey.

CalSci Academies Increase Student Interest in Science and Enhance College-bound Eligibility, **RACHELLE CALLENBACK and STEPHEN P. ANDREWS, JR.** (Environmental Sciences Teaching Program, University of California, Berkeley, 301 Campbell Hall, Berkeley, CA 94720; E-mail: rmarie@berkeley.edu).

Science education programs can be utilized to enhance the number of college-bound students from low performing schools. The Environmental Sciences Teaching Program's (ESTP) CalSci Saturday academies target economically disadvantaged and underrepresented students from San Francisco Bay Area high schools to promote and strengthen interest in science coursework. The academies engage students via an in-depth examination of local environmental issues. Undergraduates at the Berkeley campus develop and implement innovative interdisciplinary curricula. Each CalSci academy employs a hands-on approach that focuses on a science project with practical everyday applications. Recent projects have included engineering shoes suitable for walking across a mudflat, and the creation of a portable water filter system for use in emergency situations. The campus location for the academy reinforces the college-bound culture among the high school students. Many CalSci participants become eligible for enrollment in a UC environmental sciences summer course for full university credit.

Amino-G: Miracle Tracer . . . Conservative, High Solubility, Low Detectability, and Now, Reversible Signal Suppression at Low pH!!! **JAMES R. CASSIDY, JOHN E. BAHAM, and MARIA I. DRAGILA** (Department of Crop & Soil Science, Oregon State University, Corvallis, OR 97331; E-mail: james.cassidy@oregonstate.edu).

A fluorescent compound was tested for its suitability as a liquid tracer in extreme pH environments. Amino-G tracer is a fluorescent compound with a low minimum detectability, high solubility, is considered environmentally safe, and is inexpensive. It has been suggested that the fluorescence of this compound may be suppressed when used in low pH environments. This study quantified the effect of solution pH on fluorescence intensity over a full range of pH conditions and investigated fluorescence suppression reversibility. The results show that even when the suppressed fluorescence signal drops to near zero (at pH near zero), full signal recovery is possible by raising the pH of the tracer solution. Maximum fluorescence signal is attained at pH >6.

Preparing Washington's Companies to Excel in the Nanotechnology Revolution, **R. LEE CHEATHAM** (Washington Technology Center, University of Washington, 300 Fluke Hall, Box 352140, Seattle, WA 98195-2140).

From cancer care to aircraft to efficient use of electricity, nanotechnology will impact Washington State's major industries. In 2005 we created the Washington Nanotechnology Initiative to develop specific actions ensuring that companies and entrepreneurs in these industries will easily adopt nanotechnology into development of their new and existing products. Specific examples of nanoscience being put to work will illustrate this important transition and its far-reaching economic impact.

Germinal Scientist: The Development of Scientific Inquiry Skills in Young Children, **SHU-FANG CHEN and Yi- CHIN TSAI** (Department of Early Childhood Education, National Taitung University, Taiwan; E-mail: shufang@nttu.edu.tw).

Based on a two-year project of defining essential science abilities in young children, this paper will explore the development of scientific inquiry skills and its influential factors. A series of hands-on scientific tasks were designed to elicit young children's concepts and inquiry skills. One hundred and eighteen children four to six years old participated in these one-on-one assessment activities. Assessment procedures were video taped and scored afterwards. A performance-based scoring system has been developed to rate levels of children's scientific inquiry skills. Conceptual maps were drawn to represent the child's perceptions on certain scientific concepts. Different variables that may affect the development of science inquiry skills, such as age, gender, intelligence, SES, and school districts, were also explored.

It is found that children's scientific inquiry skills have developmental characteristics. The older the child is, the better the scientific inquiry skills perform. Children with an IQ at the middle or under the middle levels performed significantly lower than those with a high IQ level. Gender difference is not found in the early stage. Children from urban and suburban areas were observed performing differently in their thinking and reasoning skills. However, the difference did not reach a statistically significant level. Children whose mothers received a higher education and were not employed as a professional have a better performance in inquiry abilities than other children. It is confirmed that mother plays a more important role in children's development. No difference is found among different early childhood programs.

Varieties of Science-Humanities Convergences: Survey and Reflections, **ROBERT LOUIS CHIANESE** (Department of English, California State University, Northridge, 18111 Nordhoff Street, Northridge, CA 91330-8248; E-mail: robert.chianese@csun.edu).

With the waning of postmodern radical relativism, the humanities and arts are turning to the sciences for theories and "meta-narratives" to help answer perennial human questions. Artists draw from science theory in order to explore the human consequences of the theories, rejoice and wonder at them, and employ them as guides for shaping form and content in art. Beside science-fiction writers, these artists range from science-focused poets, writers, painters, choreographers, and sculptors, to conceptual-artists, eco-artists, and science-theory proselytizers such as architect Charles Jencks. Art exhibits often employ science-themed topics, as in "Visual Music," and the online "Science in Music" interactive at the Exploratorium.

Similarly, sciences now use the arts and humanities to aid medical healing and psychotherapy, to augment science education, and to develop clarifying theoretical models and evocative specimens, as in the aesthetically-posed plasticized cadavers of von Hagens' "Body Worlds." Science exhibits regularly add an arts component, as in the recent "Einstein," "Nano," and "Science and Sculpture" shows. A symposium at the 2003 AAAS-PD conference urged directors of natural history museums to enable patrons to create narratives in order to entice interest in the collections.

A survey of selected collaborations reveals the sciences and humanities coming together for mutual benefits like never before, without the frictions envisioned by C. P. Snow's fact/value split or the more recent antagonisms directed at science by postmodern deconstructionists. A question remains about what directions both art and science will take as they draw upon and become influenced by their different strengths.

In the Wake of Steinbeck and Ricketts: Connecting History, Literature and Ecology in the Sea of Cortez Expedition and Education Project, **JON CHRISTENSEN** (History Department and Center for Environmental Science and Policy, Stanford Institute for International Studies, Stanford University, Stanford, CA 94306-6055; E-mail: jonchristensen@stanford.edu).

In the spring of 1940, John Steinbeck and his friend marine biologist Ed Ricketts embarked on a lark that would turn into one of the great literary and scientific collaborations of the 20th century. After publishing their masterpieces, The Grapes of Wrath and Between Pacific Tides, and eager to escape and find a new way to join science and literature, they sailed south on the Western Flyer, a sardine fishing boat, from Monterey Bay to the Sea of Cortez. In the spring of 2004, science writer Jon Christensen (The New York Times, Conservation in Practice, High Country News) organized an expedition to retrace their journey with scientists from Hopkins Marine Station of Stanford University and Mexican research institutions. The Sea of Cortez Expedition and Education Project was a makeshift expedition in the spirit of the original aboard a working wooden fishing boat, the Gus-D. The expedition visited all of the same intertidal sites

surveyed by Steinbeck and Ricketts and conducted quantitative surveys of invertebrate species to make a historical comparison and establish a baseline for future studies of change in the Sea of Cortez. The project shared the literary and scientific experience with dozens of Mexican students through a hands-on bilingual education program in the Sea of Cortez, and with students and others around the world, via www.seaofcortez.org and collaborations with National Public Radio/National Geographic Radio Expeditions and the Los Angeles Times. The historical and ecological journey is also the subject of a forthcoming book from Shearwater Books/Island Press.

Why Does the Human Body Maintain a Constant 37-Degree Temperature? **PAUL W. CHUN** (University of Florida College of Medicine, Gainesville, Florida 32610-0245).

Applying the Planck-Benzinger methodology to biological systems, we have established that the negative Gibbs free energy minimum at a well-defined stable temperature, T_S, where the bound unavailable energy TDS^o = 0, has its origin in the sequence-specific hydrophobic interactions. Each such system we have examined confirms the existence of a thermodynamic molecular switch wherein a change of sign in $[DCp^o]_{reaction}$ leads to a true negative minimum in the Gibbs free energy change of reaction. Here the balance of $DH^o(T_S)(-) = DG^o(T_S)(-)_{minimum}$ and $TDS^o(T)$ = 0. At this temperature, T_S, there will be a negative minimum Gibbs free energy change, and the maximum work can be accomplished in transpiration, digestion, reproduction or locomotion. In the human body, this temperature is 37 ^oC. There is a lower cutoff point, T_h, where enthalpy is unfavorable but entropy is favorable, and an upper limit, T_m, above which enthalpy is favorable but entropy is unfavorable. Only between these two temperature limits, where $DG^o(T) = 0$, is the net chemical driving force favorable for such biological processes as protein folding, protein-protein, protein-nucleic acid or protein-membrane interactions, and protein self assembly. All interacting biological systems examined using the Planck-Benzinger methodology have shown such a thermodynamic switch at the molecular level, suggesting that its existence may be universal.

Evidence for Metal Attenuation in Acid Mine Water by Sulfate Reduction, Penn Mine, Calaveras County, California, **CLINTON D. CHURCH[1], CHARLES N. ALPERS[2], ROBERT O. RYE[3], and RICHARD T. WILKIN[4]** ([1]U.S. Geological Survey, 9353 Clairemont Mesa Blvd., Ste. G-2, PMB 580, San Diego, CA 92123; [2]U.S. Geological Survey, 6000 J Street, Placer Hall, Sacramento, CA 95819-6129; [3]U.S. Geological Survey, Denver Federal Center, Denver, CO 80225; and [4]U.S. Environmental Protection Agency, 919 Kerr Research Drive, Ada, OK 74820; E-mail: *cdchurch.h2o@netzero.com*).

The Penn Mine in Calaveras County, California, produced Cu from massive sulfide ores from 1861 to 1953. Mine wastes were removed to a landfill during the late 1990s, improving surface-water quality, but deep mine workings were not remediated and contain metalliferous water with pH near 4. Sediments recovered from the flooded mine workings were cultured for anaerobic bacteria over a range of pH (4-7.5). The molecular biology of sediments and cultures were studied to determine whether sulfate-reducing bacteria (SRB) were active within the Penn Mine in acidic conditions previously not documented for SRB.

Our data show strong evidence that sulfate reduction and associated metal attenuation are occurring in the pH 4 environment of the Penn Mine underground workings. Water-chemistry analyses reveal: (1) preferential complexation and precipitation by H_2S of Cu and Cd, relative to Zn; (2) stable isotope ratios of $^{34}S/^{32}S$ and $^{18}O/^{16}O$ in dissolved SO_4 that are 2-3 permil heavier in the mine water, relative to surface waters; (3) reduction/oxidation conditions and dissolved gas concentrations consistent with conditions to support anaerobic processes such as sulfate reduction. SEM analyses of sediment show 1.5-micrometer, spherical ZnS precipitates. PLFA and DGGE analyses of Penn Mine sediment show a high biomass level with a moderately diverse community composed primarily of iron- and sulfate-reducing bacteria. Cultures of sediment from the mine removed dissolved sulfate from solution at pH values near-neutral and near 4, forming precipitates of either iron sulfide or elemental sulfur. DGGE analysis of the cultures likewise showed the presence of SRB.

Hypolimnetic Ventilation in Crater Lake: the Long and Short (Time Scales) of It, **GREGORY B. CRAWFORD[1] and ROBERT W. COLLIER[2]** ([1]Dept. Oceanography, Humboldt State University, 1 Harpst St., Arcata, CA 95521-8299; [2]College of Oceanic and Atmospheric Sciences, Oregon State University, 104 Ocean Sciences Bldg, Corvallis, OR 97330; E-mail: gbc3@humboldt.edu).

We present and discuss observations of key limnological properties (temperature, salinity, dissolved oxygen) from the hypolimnion of Crater Lake, Oregon measured over a 14 year period (1987-2001). These observations were collected in order to characterize the processes and rates of vertical mixing in the deepest lake in the United States (594 m). Measurements from three thermistor moorings provide new insight into the time and space (horizontal and vertical) scales of the deep convection events.

Conditions during a strong ventilation year (1994-1995) and a weak ventilation year (1996-1997) were compared. The results suggest the major difference between these two years was the evolution of the stratification in the epilimnion during the first few weeks of reverse stratification. As a consequence, thermobaric instabilities were likely easier to form during 1995 than 1997.

Geomorphic Evidence for Life on Mars, **GARNISS H. CURTIS[1] and ROBIN H. CURTIS[2]** ([1]Berkeley Geochronology Center, Berkeley, CA and [2]31 Diego St., San Rafael, CA 94903; E-mail: gcurtis@uclink.berkeley.edu).

Photographs taken from orbiting satellites on the Viking and Mars Global Surveyor Missions show domes filling ancient eroded (degraded) impact craters on Mars but are themselves uneroded. Where the domes have filled the craters to their ravined walls, the margins of the domes can be seen to bury the ravines, indicating that the domes were formed long after the crater walls were eroded and were not resurgent domes related to the impacts. Moreover, many large and deep canyons on Mars have been filled to and above their rims for hundreds of kilometers with material similar to that forming the domes.

Following the formation of the domes and the filling of many canyons with domal material, all subsequent impact craters are undegraded, hence the principal agent of crater erosion, water, had disappeared. While some of the uneroded craters have small regose resurgent domes in them, none have the smoothly surfaced domes. Evidence is presented here relating the beginning of life on Mars to the period of smooth-surfaced dome formation and ending at the termination of that period the duration of which was possibly only two hundred million years or so. The period of abundant surface water on Mars has been called the Noachian system by Tanaka et al. and is the time of maximum bombardment of its surface. This period is correlated with the period of maximum bombardment of the Moon, which has been dated radioisotopically as ending approximately 3.8-3.5 billion years ago. We argue that life on Mars was a major cause of change in climate leading to its own demise and to the cold desert conditions that have obtained there to the present day. As life on Earth appears to have begun about 3.5 billion years ago, we discuss the possibility that it was seeded from Mars.

Creative Imaging Learning System, **CHARLES I. DANIELS** (Kapiolani Community College, University of Hawaii, Math-Science Department, 4303 Diamond Head Road, Honolulu, HI 96816).

Teachers want to teach, and students want to learn, but, like all human endeavors, some employ these skills better than others. Creative Imaging provides both students and teachers with a novel, powerful learning methodology. Derived from the discoveries of brain research and well-established study skills, it instructs students, through a published study guide, to an appreciation of the micro and macrostructure of text, utilizing mental imaging. Questioning, organizing, and archiving are performed under a rehearsal motif intended to facilitate long-term memory. Instructors, through a special teacher's manual, are presented with a variety of didactic approaches: (1) standard lecture with a Creative Imaging advising system, (2) highly focused mini-lectures and narrative strategies with individual student classroom study, and (3) small group interactions with collaborative learning. All of these formats involve

Socratic dialogues among students and teachers.>Student archiving is utilized to enhance both learning and memory. It also provides a quantitative measure of student effort, independent of grading. These archives can be important components of learner profiles, e-portfolios, or web logs. Data analysis of research findings and evaluation measures will be presented. The system adds enhanced security and feedback for on-line courses. The Creative Imaging Learning System is easy acquired and rapidly disseminated. A student study guide and a teacher's manual enable both learners and instructors to start improving their skills immediately. No expensive consulting or specialized conferencing are required, since the learning system is simple to understand and implement.

Multibeam Mapping of Crater Lake, Oregon and Application of Sonar Data to Model a Submerged Moss Community, **PETER DARTNELL[1], GARY LARSON[2], ROBERT COLLIER[3], MARK BUKTENICA[4], and JAMES GARDNER[5]** ([1]U.S. Geological Survey, 345 Middlefield Rd., MS-999, Menlo Park, CA 94025; [2]U.S.Geological Survey, Forest and Rangeland Ecosystem Science Center, 777 NW 9th Street, Suite 400, Corvallis, OR 97330; [3]College of Oceanic and Atmospheric Sciences, Oregon State University, Ocean Admin Bldg 104, Corvallis, OR 97331-5503; [4]Biology Department, Southern Oregon University, 1250 Siskiyou Blvd, Ashland, OR 97520; [5]Center for Coastal and Ocean Mapping, University of New Hampshire, Chase Ocean Engineering Lab, 24 Colovos Rd., Durham, NH 03824; E-mail: pdartnell@usgs.gov).

Traditionally, multibeam data have been used to map seafloor/lake floor morphology as well as the distribution of surficial facies in order to characterize the geologic component of benthic habitats. Research is presently underway to determine whether in addition to using multibeam data for geologic studies, these data can be used directly to map the distribution of biota. As a case study, we are using multibeam data collected in Crater Lake, Oregon to map the distribution of deep-water moss (*Drepanocladus aduncus*). Mapping the distribution and calculating the aerial coverage of the moss will be extremely useful for understanding the overall ecology of the lake. In the summer of 2000 the entire lake floor was mapped using a multibeam echosounder collecting both bathymetry and corrected, co-registered, acoustic backscatter at 2-m spatial resolution. To map the moss distribution, depth range, acoustic backscatter intensity, and derived bathymetric index grids are used as inputs into a hierarchical decision-tree classification model. Pixel values between the grids are compared and used to predict the presence or absence of moss. Underwater observations of moss at discrete locations around the lake are used as controls for the model. Preliminary results

show that moss covers the majority of the platform surrounding Wizard Island with the densest coverage towards the southeast. Moss is also mapped on outcrops around the caldera wall with the densest coverage in the northeast.

Hyperaccumulation, Nutrient Cycling and Detritivores, **MICHEAL A. DAVIS[1], ROBERT S. BOYD[2], KEVIN BALKWILL[3] and MICHAEL A. WALL[3]** ([1]Department of Biological Sciences, University of Southern Mississippi, Hattiesburg, MS, 39406; E-mail: mike.davis@us,.edu; [2]Department of Biological Sciences, Auburn University, Auburn, AL, 36849, USA; [3]Department of Animal, Plant and Environmental Sciences, University of Witwatersrand, Private Bag 3, Wits 2050, South Africa).

The defensive nature of hyperaccumulated metals in plant tissues has been well documented.. High concentrations of foliar metals can have significant negative impacts for certain insect herbivores. Likewise, detritivores may be negatively affected by metal-enriched leaf litter. Since detritivores are a "valve" through which carbon and nutrients flow from leaf litter into the soil, metal-enriched litter could have significant impacts on nutrient cycling in communities with high densities of hyperaccumulators. We conducted feeding and decomposition studies to examine this possibility using a Ni hyperaccumulator, *Senecio coronatus*, and two bioassay detritivores, an isopod (*Porcellio* sp.) and a millipede (*Orthoporus texicolens*). *Senecio coronatus* is unique in that both hyperaccumulating and non-accumulating populations exist on South African serpentine soils. This characteristic provides a natural source of high- and low-Ni leaf litter from the same species. We conducted litter feeding experiments, artificial diet experiments, and a litter decomposition field experiment. Dietary Ni negatively impacted both detritivores, but in different ways. Millipedes generally had increased weight loss when fed exclusive Ni-enriched diets (natural or artificial). Although isopods did not exhibit any changes in weight loss, mortality was greater for individuals fed high-Ni litter. Interestingly, isopods fed Ni-enriched litter ingested more biomass than those fed low Ni litter. Field decomposition data indicate that Ni (either foliar or soil Ni) does not affect decomposition when detritivores are excluded from litter by mesh netting. Thus, any negative effects of Ni on nutrient cycling in serpentine communities would likely stem from alterations in litter fragmentation by arthropod detritivores.

The Psychology of Signage for Long Term Radiological Storage Facilities, **STUART DAVIS** (C/O James Wise, Department of Psychology**,** Washington State University – Tri-Cities, 2710 University Drive, Richland, WA 99354; E-mail: desertwolf71@yahoo.com).

The Department of Energy (DOE) has over 100 sites around the country where radioactive contamination and waste will remain in special entombed facilities even after scheduled cleanups are completed. At these sites, which must remain undisturbed for at least a thousand years, the DOE is obliged to establish *Institutional Controls* to minimize the potential for future human exposure to the radioactive substances. Such controls are 'non-engineered' means that include land uses, notifications, procedural restrictions on access, and on-site warning signs and markers of as yet undetermined types.

The design of signage and markers to communicate the peculiar danger of a radiological waste storage site across a thousand years to an unknown future population is a challenging task. This project was a class study that focused on the psychology of the design of such long-term radiological signs and markers. The project was conducted in three parts: A Literature Review of previous work on this topic; A local residents survey (N=75) that tested respondents' judgments about signage design alternatives; and a model for Summative Design Recommendations based on the above.

Surprisingly, earlier significant work on this type of problem has not utilized principles of evolutionary and environmental psychology as guides. Our consideration of 'natural biological warning signs' led us to certain hypotheses about effective sign shape and symbol and color(s) selection, which were subsequently verified in the survey. These results suggest that there is a "Psychology of Signage" that can be utilized to successfully convey warnings of storage sites to future generations.

Science and the UFO Phenomenon, **JAMES W. DEARDORFF** (College of Oceanic & Atmospheric Sciences, Oregon State University, Corvallis, OR 97333).

Science has mostly ignored the UFO phenomenon since it burst into prominence in 1947. Exceptions were the 1969 Condon Report, and the 1969 AAAS symposium on the subject organized by Carl Sagan and Thorton Page. Although in the former study a third of the UFO reports analyzed could not be explained away, this fact was ignored in the summary provided by Edward Condon, whose chief conclusion was that science could learn nothing from such studies. In the symposium, the four particular cases presented in some detail by James McDonald were neither refuted at the time nor since. Nevertheless, the phenomenon continued to be ignored by science even though thousands of worthy UFO reports have been, and still are being, received yearly by UFO investigative groups worldwide. This disregard was due not to failure of UFO investigators to attempt to report their findings in refereed journals, but to editors refusing to publish them. This behavior in turn can be traced to the curtain of ridicule that grew around the subject since the 1950s. At present it is dominated by the scientist's fear that the "pseudoscience" label will be applied to any serious study of the subject.

Recent developments in astronomy, astrophysics, physics and exobiology, along with continued disclosures from the Freedom of Information Act and from retired military personnel, and increasing interest in the subject by foreign governments, are all contributing towards a rectification of

this situation, as evidenced in a recent paper (see www.ufoskeptic.org or www.earthtech.org).

Disclaimer: The views presented here do not necessarily reflect those of the Department of Atmospheric Sciences from which the author retired in 1986, nor of the College of OAS into which it later merged.

Cascade-Siskiyou National Monument – What it Means to be in an Ecological Crossroads, **DOMINICK DELLASALA** (World Wildlife Fund, Klamath-Siskiyou Ecoregion, 116 Lithia Way, Suite 7, Ashland, OR 97520; E-mail: dellasal@wwfks.org).

Recognizing its national significance, President Clinton designated the Cascade-Siskiyou National Monument (CSNM) in June of 2000. The Monument is at a critical ecological crossroads with plant species from distant lands mixing in this zone of overlap. With exceptional plant richness comes continentally distinctive butterfly diversity and overlap in avifauna distributions from many regions. The Monument is an important cross road for aquatic systems with fauna present from both the Rogue and Klamath systems, many of which are endemic. For the past six years, WWF has been conducting and overseeing research in the Monument, ranging from grazing impact studies to remote sensing and landscape change detection analyses. In sum, while the Monument is at an ecological crossroads, decades of logging (prior to its designation), livestock grazing, and water diversions within and surrounding the Monument have fragmented habitat at the expense of the Monument's crossroad functions. An overview of preliminary findings along with recommendations regarding conservation needs is presented based on the Monument's ecological importance and presidential proclamation.

Peaceful Versus Warlike Societies in Pre-Columbian America and Elsewhere: What Does Archaeology and Anthropology Tell Us? **JAMES DEMEO** (Orgone Biophysical Research Lab, PO Box 1148, Ashland, Oregon 97520; E-mail: demeo@mind.net).

Cross-cultural evaluations using Murdock's 1170 native, subsistence-level cultures, and plotted geographically on world maps allow the identification of regions of both high- and low-level child-abuse/neglect, patrism, social-hierarchy and violence/warfare. This method, applied in one of the most comprehensive global studies on human behavior, demonstrated the following: Old World cultures were significantly more patristic-violent than as generally seen in the New World and Oceania. Within Old World regions, the great desert belt of *Saharasia* (North Africa, Middle East, Central Asia) held the largest contiguous region of extreme-high patrism/violence on the planet, with a surrounding band of intermediate patrism/violence. Old World regions most distant from Saharasia — the Arctic fringe, Southern Africa and India, and SE Asia — were generally characterized by non-violent matrism. Within pre-Columbian Oceania and New World cultures, isolated "islands" or sub-regions of patristic violence existed amid a background of relatively peaceful matristic social conditions. Identified "massacre sites" within New World archaeology tend to geographically match regions of high patristic-violence, suggesting a linkage between relatively recent archaeology and anthropology. Global maps of cross-cultural data indicate human violence was not uniformly spread around the world, and while a dominant theme in some regions, was at very low levels in others. A drought-famine-starvation mechanism is suggested for the origins of human armoring and patristic-violence within the primary Saharasian desert region, given its history of climatic change from wet to hyperarid conditions at c.4000-3500 BCE. Mass-migrations from land-abandonment thereby spread human patristic violence worldwide, over 6000 years of history.

Environmental Impacts of Converting Irrigation Canals to Pipes, **ERIC DITTMER** (Department of Geology and Environmental Studies Program, Southern Oregon University, 1250 Siskiyou Blvd., Ashland, OR 97520; E-mail: Dittmer@sou.edu).

The conversion of irrigation canals to a piped and potentially pressurized distribution system is expected to have significant environmental impacts – both positive and negative. Significant environmental benefits will result from the use of pipes which will 1) conserve water for both agricultural and instream needs by eliminating both evaporative and infiltration losses, 2) provide pressure allowing better on-farm irrigation options, and 3) add to the vitality of agricultural land use in a valley subject to increasing urban growth pressures. However, the WISE Project proponents must also anticipate the potential negative effects, including 1) reducing ground water recharge from leaking canals, potentially affecting nearby shallow wells, 2) eliminating artificially created wetlands caused by leaking canals, 3) altering of public recreational access now common along parts of the open canal system, as well as 4) construction impacts, especially where new pipe alignments are expected.

The presentation will discuss each of these impacts, note possible mitigation techniques, and attempt to weigh the positive and negative aspects of the project overall. The audience will be encouraged to offer ideas and input to these issues.

Chemical and Geological Aspects of Acid Mine Drainage at the Blue Ledge Mine, Siskiyou County, California, **WILLIAM S. ELLIOTT[1], JR, WES W. SHERLOCK[2], and STEVEN C. PETROVIC[1]** ([1]Departments of Geology and Chemistry, Southern Oregon University, 1250 Siskiyou Blvd., Ashland, OR, 97520; [2]Department of Geological Sciences, University

of Nevada, Reno, MS/172, Reno, NV 89557-0180; E-mail: elliottw@sou.edu).

The Blue Ledge is an abandoned underground copper mine that exploited a polymetallic massive sulfide deposit from 1906 to 1919 in Siskiyou County, California. The massive sulfide zone varies in width from 0.1 m to 3 m and extends laterally for at least 1000 m and dips from 70° to near vertical. The ore zones are primarily constrained by quartz-sericite-pyrite schist, with chlorite schist constituting the footwall. The massive sulfides are composed primarily of paragenetic pyrite that has been fractured and locally brecciated with late stage interstitial sphalerite, chalcopyrite, quartz and lesser amounts of arsenopyrite, bornite, galena, and locally massive pyrrhotite.

Standing pools of water within the Blue Ledge Mine have pH values ranging from 2.3 to 2.5, a dissolved solids content of 500 to 600 ppm, and temperatures between 12° and 14°C. Preliminary studies regarding metal loading in the mine discharge indicate the dissolved total iron content was determined to be 410 ppm with a pH of 2.3 to 2.4. During the wet season, the acidic water is flushed into nearby Joe Creek, increasing the pH of the mine discharge, inducing toxic metal loading, and resulting in the precipitation of numerous iron oxides and hydroxides in the streambed. A recent acquisition of an Inductively Coupled Plasma Optical Emission Spectrometer will enable a complete investigation of the metal distribution from the standing pools in the adits of the Blue Ledge Mine and the mine discharge flowing into Joe Creek.

Spatial Data Mining and Soil-landscape Modeling Applied to Soil Survey, **ABELHAMID A. ELNAGGAR[1], JAY S. NOLLER[1] and MARK KELLER[2]** ([1]Department of Crop and Soil Science, Oregon State University, Corvallis, OR 97331; [2]Natural Resources Conservation Service, Hines Service Center, P O Box 848, 30 Hwy 20 South, Hines, OR 97738; E-mail: abdelhamid.elnaggar@oregonstate.edu).

Data mining techniques are studied to extract knowledge from GIS databases in order to improve updates of existing soil maps and to help in developing a preliminary soil map for neighboring unmapped sites. Classification tree is one of the widely used inductive learning methods to retrieve the expert knowledge and extract spatial patterns in soil maps and other natural resource maps. This method is introduced here to extract knowledge about the soil-landscape model used by the Harney County, OR, soil survey. Spatial environmental data of geology, vegetation, terrain attributes (elevation, slope, aspect, and profile and plan curvatures), and remote sensing data at a resolution of 90m are used as predictors of soil map units. Two strategies are used in collecting spatial data from the studied environmental variables. One involves using the entire set of pixels within each soil map unit, whereas a sampling strategy based on the modes of environmental histograms is developed in the second. The selected environmental variables are expected to show variations between the different soil map units in the studied area. The classification tree should present the soil map units in the studied area where there is distinct spatial variation between their environmental variables.

Supporting Innovations in Irrigation Water Management, **KEITH EMERSON** (Orchard Director, Bear Creek Corporation, 2518 S. Pacific Highway, Medford, OR 97501).

Irrigation technology has surpassed the ability of the 100 year old canal system in the Bear Creek and Little Butte Basins to provide water for agriculture on a dependable and season long basis. Changing land uses, irrigation district customer bases, new agricultural crops, meeting instream needs for aquatic species, and managing water deliveries while minimizing impact on threatened fish all add complexity to an aging system.

This presentation will describe the challenges of bringing the innovation of irrigation science to farmland while striving to maintain a sustainable balance with the natural systems in the area and provide options for improved water management in the future.

Language Groups and Coastal Connections: mtDNA in Western North America, **JASON A. ESHLEMAN** (Trace Genetics, Inc., 4655 Meade Street, Suite 300, Richmond, CA 94804; E-mail: jason@tracegenetics.com).

Before European contact, the western edge of North America exhibited an exceptionally high level of linguistic diversity. This great diversity has been cited as evidence for a great antiquity of human occupation in these regions while particular patterns of this diversity have also been used to formulate hypotheses of human migration and expansions in western North America. Mitochondrial DNA haplogroup frequencies and sequence data from Native American individuals in western North America was analyzed to test hypotheses regarding the settlement of this region. These data suggest that Hokan and Penutian, two hypothesized ancient linguistic stocks, represent biological units as a result of shared ancestry within these respective groups. Although the pattern of mtDNA variation suggests regional continuity and gene flow between populations has contributed much to the genetic landscape of western North America, the existence both the Hokan and Penutian phyla appears to be supported by genetic data. In addition, a comparison between coastal and inland populations along the west coast of North America suggests an ancient coastal migration to the New World. Shared mtDNA types among coastal populations in the Northwest and along the California coast suggests that early migrants to the New World settled along the coast with little gene flow into the interior valleys.

Cognitive Mathematics: Using the Brain's Innate Abilities for Mathematical Understanding, **SUZANNE FARNSWORTH** (Department of Psychology, Southern Oregon University, 1250 Siskiyou Blvd., Ashland, OR 97520).

Cognitive mathematics is a relatively new discipline that suggests that mathematics is a cognitive process utilizing such cognitive mechanisms as image schemas and conceptual metaphors. This view is in contrast with the popular notion that mathematics is objective and exists externally. Recent research in the teaching of mathematics to grade school children suggests that using a cognitive approach enhances mathematical understanding. This talk will present an original experiment conducted by the author on the cognitive nature of mathematics. The current study involved 38 college students (16 experimental, 15 control, 7 pretest only). The participants were given a pretest that contained concepts from set theory in both classical and cognitive format. The participants were then randomly assigned to either a classical (control) or cognitive (experimental) lecture group, after which they were given a similar posttest. The results of the experiment were reliable, and supported the view that cognitive mathematics is an effective tool for teaching mathematical concepts. The results also supported the principle that mathematics is innate to human understanding.

Enhanced Heat Transfer through the Use of Nanofluids In Forced Convection, **DANIEL FAULKNER[1], JUSTIN DAVIDSON[1], REZA SHEKARRIZ[1], and DAVID RECTOR[2]** ([1]MicroEnergy Technologies, Inc., 3525 SE 17th Ave., Portland, OR 97202; [2]Pacific Northwest National Laboratory, 902 Battelle Blvd., Richland, Washington 99352; E-mail:dan.faulkner@microet.com).

Much attention has been paid in recent years to the use of nanoparticle suspensions for enhanced heat transfer. The majority of this work has focused on the thermal conductivity of these nanofluids, which can be as much as 2.5 times higher than that of the plain base fluid. The present work moves beyond measurements of non-flowing liquids, to explore the role that nanofluids can play in enhancing convective heat transfer within micro-scale channels. A unique pseudo-turbulent flow regime is postulated, which simulates turbulent behavior at very low Reynolds numbers, in what are nominally laminar flows. The resulting fluid mixing has the potential to raise the average convective heat transfer coefficient within the channel. Numerical modeling, using the lattice Boltzmann method, confirms the existence of the pseudo-turbulent flow regime. Finally, experimental results are presented which demonstrate a significant heat transfer enhancement when using nanofluids in forced convection. The current results are especially relevant to microchannel heatsinks, where the low Reynolds numbers impose limitations on the maximum Nusselt number achievable.

Seasonal Nutrient and Plankton Dynamics in a Physical-Biological Model of Crater Lake, **KATJA FENNEL[1], ROBERT COLLIER[2], GARY LARSON[3], GREG CRAWFORD[4], and EMMANUEL BOSS[5]** ([1]Institute of Marine and Coastal Sciences, Rutgers University, New Brunswick, NJ 08901; [2]College of Oceanic and Atmospheric Sciences, Oregon State University, Corvallis, OR 97331; [3]USGS Forest and Rangeland Ecosystems Center, Forest Science Laboratory, Oregon State University, Corvallis, OR 97331; [4]Department of Oceanography, Humboldt State University, Arcata, CA 95521; [5]School of Marine Sciences, University of Maine, Orono, ME 04473; E-mail: rcollier@coas.oregonstate.edu).

A coupled 1D physical-biological model of Crater Lake is presented. The model simulates the seasonal evolution of two functional phytoplankton groups, total chlorophyll, and zooplankton in good quantitative agreement with observations from a 10-yr monitoring study. During the stratified period in summer and early fall the model displays a marked vertical structure: the phytoplankton biomass of the functional group 1, which represents diatoms and dinoflagellates, has its highest concentration in the upper 40 m; the phytoplankton biomass of group 2, which represents chlorophyta, chrysophyta, cryptomonads and cyanobacteria, has its highest concentrations between 50 and 80 m, and phytoplankton chlorophyll has its maximum at 120 m depth. A similar vertical structure is a reoccurring feature in the available data. In the model the key process allowing a vertical separation between biomass and chlorophyll is photoacclimation. Vertical light attenuation (i.e. water clarity) and the physiological ability of phytoplankton to increase their cellular chlorophyll-to-biomass ratio ultimately determine the location of the chlorophyll maximum. The location of the particle maxima on the other hand is determined by the balance between growth and losses and occurs where growth and losses equal. These new model results also suggest that the vertical exchange of dissolved and suspended (non-settling) particulate organic matter may solve observed imbalances between the settling particulate organic nitrogen fluxes collected by sediment traps, and simple box model budgets of inorganic nitrogen (Dymond et al., Limnology and Oceanography 41:732-743, 1996).

Reproductive Biology of an Endangered Serpentine Endemic plant, Phlox hirsuta *(Yreka Phlox),* **JULES FILIPSKI** (Department of Biology, Southern Oregon University, Ashland, OR 97520; E-mail: julesbub@Yahoo.com).

Phlox hirsuta is an endangered serpentine endemic plant with a limited distribution in Siskiyou County, California. The overriding goal of this research was to contribute to a better understanding of the life history, especially the reproductive

strategies, of *P. hirsuta.* The major objectives of this research were to determine the mating system of *P. hirsuta* and the role of pollinators in seed set. Knowledge of a plant's mating system(s) has potential application in management to conserve genetic variability (Kearns 1993). No research on the mating system of *P. hirsuta* existed prior to this research. We performed a pollinator exclusion experiment and insect observations at two sites for two consecutive seasons. Seeds were collected from treatment plants and seed viability and germination rates were determined. Preliminary results suggest that *P. hirsuta* is an obligate outcrosser and produces a high amount of viable seed, which germinates readily in the lab. The major insect visitors to *P. hirsuta* are Lepidopterans but they were infrequently observed on the plants. In addition, seedling recruitment in the field was not observed. This may be due to herbivory or environmental conditions.

Metal(loid) Solubility in Persistently Reducing Mining-Impacted Wetland Sediments, **DOUGLAS C. FINKELNBURG, GORDON R. TOEVS, and MATTHEW J. MORRA** (Environmental Sciences Program and Land Resources Division, University of Idaho, Moscow, ID 83844; E-mail: fink4961@uidaho.edu).

Floodplain sediments along the South Fork of the Coeur d'Alene River in Idaho are enriched in As, Cd, Pb, Zn, and other trace elements as a result of over a century of mining activity in the Silver Valley mining district. Factors responsible for mobilization of the contaminants and their release into the aqueous phase are not well understood. Solublization of metal(loids) is an important step in many biotic uptake pathways. Our objective was to characterize the solubility of metal(loids) in persistently saturated, contaminated pond sediments within the floodplain. Total metal(loid) concentrations in the sediments were determined on cores retrieved using Plexiglas pipe. Sediment porewater was sampled to depths of 36 cm using equilibrium samplers installed in the sediment and retrieved 4 weeks later. Sediment analysis showed lead concentrations as high as 12,056, As 256, Cd 129, and Zn 10,074 mg/kg. Soluble iron was found in benthic boundary porewater year round at increasing concentrations with depth. SO_4^{2-} was present in the porewater at detectable concentrations in spring/early summer, but only minimal SO_4^{2-} was detected in late summer/fall porewater samples. Despite redox changes as determined using indicative species, no As, Cd, Pb, or Zn were detected in porewater collected in any season. Our investigations indicate that persistently reducing saturated wetlands do not release metal(loids) to the aqueous phase. Maintenance of these conditions in metal(loid)-contaminated wetlands may be a best management practice to reduce metal(loid) solubility and potential bioavailability.

Extraordinary Endemic Springsnail Radiation in the Cascade-Siskiyou National Monument, Southwest Oregon, **TERRENCE FREST and EDWARD JOHANNES** (Deixis Consultants, 2517 NE 65th St., Seattle, WA 98115; E-mail: tjfrest@earthlink.net*).*

The Cascade–Siskiyou National Monument is situated at a critical location as regards freshwater snail (springsnail) distribution, peripheral to the recently discovered rich–*Pyrgulopsis*-dominated faunas of the Great Basin but interior to coastal and northern faunas with few springsnails. Recent survey of the Monument and surrounding lands demonstrated the presence of an exceptionally diverse headwater springsnail fauna characterized by an endemic radiation in the "genus""*Fluminicola* (Rissooidea: Lithoglyphidae). Formerly this non-monophyletic genus was known from 9 species. The Monument fauna includes at least 12 new taxa, displaying a wider range of variation than otherwise known for the "genus". Typical diversity per site is one species. In the Monument, a single, small drainage may have 5 or more taxa sympatric, a highly unusual situation for freshwater springsnails worldwide. This middle Klamath drainage radiation appears to be paralleled by adjacent local radiations in the Rogue drainage, upper Klamath drainage, and upper Sacramento-Pit drainage, only one of which has been extensively studied. There appear to be almost no taxa in common between these endemic centers, suggesting that diversity in this group may approach that of *Pyrgulopsis*, currently with ca. 124 species.

Serpentine Soils along a Precipitation Gradient in Northwestern California, **R.C. GRAHAM[1], T.E. LAURENT[2] and K.L. ROSE[1].** ([1]Soil & Water Sciences Program, University of California, Riverside, CA 92521-0424; [2]Klamath National Forest, 1312 Fairlane Rd., Yreka, CA 96097; E-mail: robert.graham@ucr.edu).

Soils derived from serpentinite along a 115 km east-west transect in the Klamath Mountains were sampled to examine the effect of mean annual precipitation (MAP; 457-2795 mm) on soil properties. The transect was limited to soils with a mesic temperature regime. Vegetation ranged from shrub/forb/grass communities on the dry end to coniferous forest along most of the transect. *Pinus jeffreyi* was found on all forest sites, with *Calocedrus decurrens* on all but the wettest site, where *Pseudotsuga menziesii* was found. All soils had horizons of illuvial clay concentration, with maximum clay contents ranging from 16-61% and no trend related to MAP. Soil pH, ranging from 5.6 - 7.5 in A horizons and 6.3 - 7.9 in Bt horizons, was highest at the driest sites. Exchangeable Ca/Mg ratios were <0.7 in A horizons and <0.3 in Bt horizons. Smectite dominated the clay fraction of Bt horizons. Soils derived from felsic rocks along the same transect were analyzed for comparison. These soils supported mixed conifer forest on the dry end and *Pseudotsuga menziesii* forest on the rest of the transect. The soils had lower maximum clay

contents (13-39%), were more acidic (1-2 pH units lower), had Ca/Mg ratios of 2 - 12 in A horizons and 7 - 0.7 in B horizons, and clay fractions dominated by kaolin rather than smectite.

Biogeochemistry and Phytoextraction of Nickel in Serpentine Soil, **PAUL R. GROSSL** (Dept. Plants, Soils, and Biometeorology, Utah State University, 4820 Old Main Hill, Logan, UT 84322-4820; E-mail:grossl@cc.usu.edu).

Over the past ten to fifteen years there has been great interest in using metal hyperaccumulating plants to rehabilitate lands impacted by potentially toxic levels of trace metals.

Streptanthus polygaloides, naturally occurring on serpentine soils in California, is a known hyperaccumulator of nickel (Ni). The goal of this study was to assess *S. polygaloides'* ability to phytoextract nickel and other toxic metals and evaluate its potential as a soil remediation tool. The assessment included data from field, hydroponic, greenhouse, and laboratory bench scale studies, as well as geochemical modeling predictions. Results from hydroponic studies indicated that *S. polygaloides* continuously exposed to 10 mM Ni could maximally accumulate 2 % Ni on a dry weight (DW) basis in its shoots without any apparent signs of stress. Exposure to higher levels of Ni did result in decreased biomass production. *S. polygaloides* growing in serpentine soils both in the field and greenhouse accumulated only about 0.5% Ni in its shoots (DW). The factor governing Ni shoot accumulation levels in *S. polygaloides* is the bioavailability of Ni in serpentine soils. Hence, the only way to increase Ni accumulation is to increase Ni bioavailability in soil environments. Of the total Ni concentration (3000 ppm) in the serpentine soil only about 1% of the total was bioavailable – this pool consisted of soluble and exchangeable Ni. Although the use of *S. polygaloides* does not look promising as a remediation tool, it may have potential as a bio-mining agent on low grade ore materials.

Relationship Between Body Size and Peak Abundance in Spawning Kokanee, **MARK C. GROVER** (Department of Biology, Southern Utah University, Cedar City, UT 84720; E-mail: grover@suu.edu).

I used a graphical model incorporating information on foraging habits and temporal patterns of density-dependent resource limitation to develop predictions concerning the presence and nature of size-abundance relationships in salmonids. Based on these predictions, I tested the hypothesis that resource limitation among older/larger juveniles leads to density-dependent growth and a steep negative relationship between abundance and size at maturity among kokanee (non-anadromous *Oncorhynchus nerka* associated with a single-lake system during their entire life). The relationship between size at maturity and abundance at the peak of the spawning run was evaluated in a kokanee population that experienced a large increase in accessible spawning habitat following the loss of a spawning barricade at Bucks Creek, California, USA. The increase in reproductive output and juvenile recruitment associated with the loss of the spawning barricade led to a decrease in growth rates, a shift to an older age at maturity, and a decrease in size at maturity. Collectively, the data, which spanned a period of 33 years, demonstrated that average body sizes of adult kokanee have exhibited a consistent negative relationship with peak abundances during spawning. The slope of the relationship was consistent with the hypothesis that density-dependent growth was the major cause of the negative size-abundance relationship exhibited by the population. Comparisons of size-density relationships before and after the loss of the spawning barricade indicated that territorial spacing during spawning did not have a significant influence on population densities. Instead, the size-abundance relationship during spawning reflected pre-spawning population densities and growth rates.

Participant Observation among Kabbalists Who Construct Their Literature and Activities as Science, **J. BARRY GURDIN** (To Love and to Work: An Agency for Change, 3049 Noriega Street, San Francisco, CA 94122-4151; E-mail: gurdin@sbcglobal.net).

Around major universities, institutes, such as the Center for Theology and the Natural Sciences in Berkeley, California, conduct conferences, seminars, and publications around issues of faith and science that were reported to play an important role in the US presidential election of 2004, while, prestigious presses reflect current public interest by publishing such titles as Ian G. Barbour's *Religion and Science: Historical and Contemporary Issues* (San Francisco: HarperSanFrancisco, 1997(1990)). With the collapse of Communism with its official ideology of atheism, in the former Soviet Union, émigrés from the Commonwealth of Independent States (CIS)—many with advanced training in sciences—display noteworthy new cultural and social beliefs and behavior in regards to spirituality. The current paper reports on the second year of a participant observatory study of an example of one of the new spiritual groups, Kabbalists, in San Francisco, California—many of whom are recent immigrants to the USA from the CIS—who socially construct the Kabbalah as Science. Their views are compared to other physicists and spiritual scholars who agree with them and contrasted to those who identify parallels between the Kabbalah and Science, and other major scholars who view it as mysticism. The sociologist and anthropologist pinpoints an economic infrastructure, exemplified by the Templeton Lecture Series, that regularly features major scientists, and new cultural groups, illustrated by the physicists in the film, *What the Bleep Do We Know?!*, who promote harmony between the scientific and spiritual world views, and their adversaries, scientists who blog against this trend.

Chemistry and the Community, **CHELSEA GUSTAFSON, PHIL CLARK, and JENNIFER WALKER** (Department of Chemistry, Southern Oregon University, 1250 Siskiyou Blvd., Ashland, OR 97520).

The Alchemists (Southern Oregon University Chemistry Club) brings chemistry to families in Southern Oregon by hosting events aimed at getting young children through adults excited about the chemistry around us. Interactive experiments with household chemicals and hands-on activities for kids of all ages are presented at community centers. The children and their parents experience the wonders of science while the university students earn valuable teaching, leadership, and organizational skills.

GEMs: A Database of Greener Education Materials for Chemists, **JULIE HAACK** (Department of Chemistry, University of Oregon, Eugene, OR).

The incorporation of green chemistry principles into the chemistry curriculum provides new opportunities to enhance the curriculum and engage a broader spectrum of students in the study of chemistry. In order to facilitate the development green chemistry educational materials and their incorporation into the chemistry curriculum, we have designed an interactive, web-based database of Greener Education Materials for chemists called GEMs. The database provides a tool for the organization and dissemination of core green chemistry educational materials that can be utilized to support chemical education across chemical disciplines (e.g., general, organic, physical, analytical, materials, etc.) and among diverse educational audiences (e.g., K-12, colleges and universities). Since the database will include both published and original submissions, it provides the infrastructure for collaborative development of this resource among the chemical education community.

Paleoecology and Human Biological Models for the Pacific Northwest Coast in the Late Pleistocene, **ROBERTA L. HALL** (Anthropology Department, Oregon State University, Corvallis, OR 97331; E-mail: rhall@oregonstate.edu).

Models of Late Pleistocene migration into the Americas are traditionally based on a methodology summarized as "Map the sites and their dates, and connect the dots." Although some attention has been paid to climatic conditions as well as dates of the last glacial maximum, expected sea levels, and inter-continental connections, too little work has considered how these past environmental conditions would have affected human biology and behavior. Physical anthropologists have considered inter-continental similarities in mtDNA haplotypes and cranial morphology but have barely explored human biological adaptations and the climatic dimensions of human comfort zones, two important considerations that affect human migrations. This paper uses recent reconstructions of Late Pleistocene paleoecology, requirements of human ecology, and cranial data from past populations to argue that a coastal migration model is more consistent with available data than is an interior model. I also critique human biological approaches to Ice Age people that focus on similarities among living peoples but ignore adaptational forces. I acknowledge with gratitude the support of Oregon Sea Grant in this research.

Can the Source of the Devils Garden Basalt Flow be Determined by Using NIH Image and StereoWin Software? **DEBRA HALLIS** (Geology Department, Humboldt State University, 1 Harpst St., Arcata, CA 95521).

The National Institute for Health has created software called "NIH Image" for laboratory use in the medical field. I conducted a study to ascertain if NIH Image software could be used to determine flow direction in the Devils Garden basalt located in the Modoc Plateau of northeastern California.

In the past, orientations of elongate grains in thin sections were measured using a flat stage microscope which can be labor intensive. I took photomicrographs of orientated thin sections from samples collected from the surface of the Devils Garden basalt. Plagioclase orientations in photomicrographs were determined by NIH Image software. If orientation patterns exist, they are ascertained quicker with a simplified binary model of NIH Image than with a petrographic microscope. Unfortunately, orientation patterns were not present in most of the images analyzed.

Data were entered into StereoWin software to produce a rose diagram model. Angles of elongate grains are represented by "petals" of varying lengths in the rose diagram. The more grains there are in the same group, the larger the "petal" in the model. In most of the models, petal lengths and orientations were randomly distributed throughout the rose diagrams suggesting no observable flow pattern.

Because no patterns of crystal orientation were observed in either analyzed images or rose diagrams, I conclude that elongate grains are randomly orientated. Without clear orientation, direction of flow (thus direction to the source) of Devils Garden basalt could not be determined. Lack of a preferred orientation is consistent with diktytaxitic texture in the basalt.

Dow Wetlands Preserve Provides Practical Research Experiences for Community College Students, **PAMELA Z. HAN and WILLIAM B.N. BERRY** (Environmental Sciences Teaching Program, University of California, Berkeley, 301 Campbell Hall, Berkeley, CA 94720; E-mail: pzhan@berkeley.edu).

The Dow Wetlands Preserve is a located on the banks of the San Joaquin River in Antioch, California. Not only a site for environmental science research, this 470-acre area is also the location of the Environmental Sciences Teaching Program's (ESTP) educational outreach efforts. Once a month, Los Medanos Community College (LMCC) students come to the Dow Wetlands to apply classroom principles of

chemistry in wetland field research. This group of thirty five students interacts with undergraduates from the University of California, Berkeley to learn about water quality testing, soil macroinvertebrates, and grass planting. Undergraduate involvement is an integral part of the outreach effort. UC Berkeley students teach lessons related to current research topics at the site and give homework assignments to test student understanding. LMCC students learn about the use of water quality testing equipment such as the multimeter and colorimeter and gain an understanding of applications of chemistry in a practical field research setting. In addition to the academic training that the UC Berkeley students provide, they also serve as a source of information about being a university student. Educational outreach efforts at the Dow Wetlands Preserve integrate educational outreach with hands-on scientific approaches to provide university-level research experience to community college students.

Record Rains in Southern California 2004 – 2005, **GARY HANNES[1], SUSAN HANNES[2], and ANNE HANNES[3]** ([1]Department of Geography, California State University Fullerton, Fullerton, CA 92834; [2]Department of Geography, Santiago Canyon College, Orange, CA 92869; [3]University of California Santa Barbara, Santa Barbara, CA 93106; E-mail: gphannes@earthlink.net).

This poster displays the month by month 500 mb charts and sea level pressure maps for the fall and winter months (2004 - 2005). Also shown are various surface synoptic maps and satellite photographs. A brief analysis of the weather systems that produced the second-wettest year on record (at Los Angeles) is presented.

Ultraviolet Radiation in Crater Lake, Oregon, **BRUCE R. HARGREAVES[1], SCOTT F. GIRDNER[2]*, MARK W. BUKTENICA[2], ROBERT W. COLLIER[3], ENA URBACE[4], and GARY L. LARSON[5]** ([1]Department of Earth & Environmental Sciences, Lehigh University, Bethlehem, PA 18015; [2]Crater Lake National Park, Crater Lake, OR 97604; [3]College of Oceanic and Atmospheric Sciences, Oregon State University, Corvallis, OR 9733; [4]Department of Agronomy, University of Wisconsin-Madison, Madison, WI 53706; [5]USGS Forest and Rangeland Ecosystem Science Center, Corvallis, OR 97331; E-mail: scott_girdner@nps.gov).

Crater Lake Oregon is known for its uncommonly clear water and striking blue color. These same characteristics, along with other features of this caldera lake, contribute to the deep penetration of solar ultraviolet radiation (UVR) and development of deep phytoplankton biomass and chlorophyll peaks (60m and 130m, respectively) during summer months. Near-surface diffuse attenuation coefficients (K_d) for UVR in Crater Lake are extremely low compared to other natural waters. Factors contributing to the extreme near-surface transparency of UVR include the scarcity of living organisms above 40m, associated low levels of dissolved organic matter, and the scarcity of rain or watershed runoff during summer months. Other controlling factors include limited atmospheric or terrestrial nitrogen sources, lack of soil organic matter in the watershed, and strong incident UVR at relatively high elevation. Measurements in the past several decades have shown variations in phytoplankton abundance and turbidity that appear to explain the variations in K_d for UVR. Estimates of Kd for UVR derived from earlier measurements of Secchi depth and photometer measurements of blue light in the water column suggest that Crater Lake has fluctuated on a decadal scale by a factor of two, but no long-term trend is apparent over the past century.

Report on the Ten Year Forecast of the U.S. Remote Sensing Industry, **GEORGE F. HEPNER**, (Southwest Center for Environmental Research and Policy, Department of Geography OSH 270, 260 S. Central Campus Dr., University of Utah, Salt Lake City, UT 84112-9155; E-mail: george.hepner@geog.utah.edu).

Geospatial science and technology has undergone tremendous change in recent years. This report is an analysis and forecast of the commercial, governmental and academic sector use of satellite and aerial platform imagery, and image-based geographic information systems. The forecast project, initiated in 1999, is an on-going venture intent on creating a rolling ten-year forecast updated every three to five years. The project employs a variety of information sources including interviews with corporate leaders, confidential revenue reports, internet surveys, focus groups and supplemental industry sources. The report addresses the size of the industry, expected growth rate over the next ten years, current and future market segments, expected technological advances, such as new sensors, and the workforce requirements for the future. The project is a collaboration of the American Society for Photogrammetry and Remote Sensing (ASPRS), NOAA, NASA, USGS, numerous private firms and academic institutions.

Digitally-Enhanced Thin-Layer Chromatography: An Inexpensive, New Technique for Qualitative and Quantitative Analysis, **AMBER I. HESS** (Stevenson School, 3152 Forest Lake Road, Pebble Beach, CA 93953; E-mail: awih@KLHess.com).

Thin-layer chromatography (TLC) is a widely used method for qualitative analysis to determine the number of components in a mixture, to determine the identity of two substances, or to monitor the progress of a reaction. The more accurate high-performance TLC (HPTLC) is better suited for quantitative analysis. Unfortunately, HPTLC requires expensive equipment which most high schools and colleges cannot afford.

This poster will present a novel method of combining digital photography with standard TLC to improve qualitative analysis as well as make accurate quantitative analysis

possible. This method, termed "digitally-enhanced" TLC (DE TLC), is very easy to use. A fluorescent TLC plate is illuminated with UV light and a picture of the plate is taken with a digital camera. Then, on a computer, using either the public domain software TLC Analyzer or common photo-editing software, one can quickly produce multi-spectral scans, densitograms, and calibration curves–output previously available only from more expensive equipment or complex procedures. DE TLC produces results with high linearity (R^2 ~ 0.97 – 0.99), good repeatability (RSD < 5%), and detection limits approaching those of HPTLC at a significantly lower cost.

Digitally-Enhanced TLC is a valuable tool that can be added to every chemist's TLC toolbox. Since this technique is much less expensive than other quantitative chromatographic methods, DE TLC is ideal for high school and college laboratories.

Compliance of Hand-Washing Behavior in Regard to Gender when Prompted with a Sign, **CAROL HIBNER** (Psychology Department, Southern Oregon University, 1250 Siskiyou Blvd., Ashland, OR 97520; E-mail: kat_hi@yahoo.com).

Washing one's hands after using the restroom is preached to young children in American culture. This behavior is not always practiced, even in public restrooms. Many businesses place signs up, prompting patrons and employees to wash their hands. This study sought to show that the signs do make a difference in hand washing behavior. From a sampling of college students at Southern Oregon University, 104 restroom users were watched to see if they washed their hands. 96% of women washed their hands before a sign was posted and 95% washed after the sign was posted. 57.4% of men washed their hands prior to the sign being posted, while 72% washed after the sign was posted. This study found that although almost all women washed their hands, the signs could still positively affect hand-washing behavior.

Speciation of Pb, Zn, As, and Cd in Soils Developed on the Coeur d'Alene River Floodplain, **PATRICK HICKEY and DANIEL G. STRAWN** (Soil and Land Resources Division, University of Idaho, Moscow ID, 83844-2339; E-mail: hick0182@uidaho.edu).

Mining operations in the Coeur d'Alene (CdA) Mining District have resulted in fluvial deposition of sediments contaminated with Fe, Mn, Zn, Cd, As, and Pb on the CdA River banks and seasonal wetlands along the lower Basin floodplain. Elevated soil metal concentrations pose risks to wildlife and humans in the region. In this study we are investigating soil mineralogy and contaminant associations in soils relative to morphological features, particle size, and other elements. XRD revealed that the crystalline minerals in the clay-size fraction of the soils are dominated by quartz and mica. Selective extraction of iron oxides showed that more than 2/3 of the extractable iron is in the poorly crystalline phase, e.g., ferrihydrite. Total elemental analysis of iron stained and depleted regions in the soils showed positive correlations between Fe and Pb, and Zn. Arsenic was enriched in the iron depleted regions, while no correlations between Cd and Mn existed. Electron microprobe analyses showed strong associations between Mn and Pb, and moderate Fe-Pb associations. Manganese-P associations were weak, while Fe-P associations were strong, especially in soils amended with phosphorus. There were no correlations between Pb and P. Contaminant concentrations in soils are often reported on a whole soil basis. However, the dynamic nature of seasonally saturated soils results in changes in speciation that impact bioavailability and leachability. Results from this study provide insight into contaminant speciation that can be used to improve remediation strategies, risk evaluation, and management.

Addressing Irrigation Water Needs Using Reclaimed Water, **JIM HILL** (Water Reclamation Division Administrator, City of Medford, City Hall, Medford, OR 97501; E-mail: jhill@ci.medford.or.us).

As growth and in-stream demands for water increase, the Rogue Valley is faced with the need to optimize the use of its available water, or face shortages in the future. The agricultural community is already seeing late summer water shortages that can affect the crops being grown. As new regulations are put into place to protect the threatened and endangered fish in our streams, there will be a greater demand to keep the cleaner, colder water in-stream that is currently being used for irrigation purposes, potentially leaving less water available for agricultural purposes. A combination of water conservation measures and supplementing existing irrigation flows with reclaimed water will assure improved stream flows and water quality, while also providing a secure agricultural irrigation supply.

Reclaimed water is perfectly suited for agricultural irrigation purposes. The nitrogen and phosphorous in reclaimed water will provide an average of about 25% of crop nutrient requirements when applied at agronomic rates. Also, reclaimed water is a consistent, steady water source that will always be available during the irrigation season, and will not be affected by drought conditions.

This presentation will discuss the agricultural and in-stream benefits of reclaimed water for irrigation, selected projects throughout the country that are already irrigating with reclaimed effluent, and ongoing efforts in the Rogue Valley to demonstrate the value of reclaimed effluent for irrigating fruits and vegetables. .

A Computational Model for the Study of Genetic Evolution in a Spatially Explicit Context, **GUY A. HOELZER[1] and RICH DREWES[2]** (Departments of Biology[1] and Computer Science

and Engineering[2], University of Nevada Reno, Reno, NV 89557; E-mail: hoelzer@unr.edu).

Population genetics theory has been firmly grounded in mathematical models since its inception in the 1930's. The parameters in these models have been limited in their information content to mean field approximations; that is, the mean value overall is used to represent the condition everywhere. For example, the most influential model in the theory of spatial population genetics has been the Island Model of Migration, which assumes that every subpopulation has the same number of individuals, the same migration rate, and so on. An alternative approach to modeling gene pool evolution involves numerical (or computational) modeling. Computational models are far more structurally flexible than most mathematical models because they can allow correlations to develop within the system that are inconsistent with mean field representation. We are developing a computational model of genetic evolution in spatially extended populations to explore generic tendencies for pattern formation (self-organization) and evolutionary dynamics under isolation by distance. Our model, a generalized agent-based cellular automaton, shares fundamental biological features with traditional models, such as diploidy, sexual reproduction, and stochastic mutation. However, it differs from most existing mathematical models in the following ways: it permits fluctuating local population sizes; it assumes stochastically variable dispersal distances; it assumes a finite space and allows for idiosyncratic spatial configurations of individuals and alleles. We will report on unusual aspects of evolutionary dynamics and spatial pattern formation under this model that differ from conventional expectations, and argue that real biological populations are more likely to behave as our model suggests.

Patterns of Vegetation Change and Past Management Activities of the Cascade-Siskiyou National Monument, **PAUL E. HOSTEN** (Bureau of Land Management, Medford District, 3040 Biddle Road, Medford, OR 97504; E-mail: Paul_Hosten@blm.gov).

Historic vegetation change and past management activities of upland plant communities identified as contextual information for ongoing livestock impact studies within the Cascade-Siskiyou National Monument (CSNM) serve also as context for understanding ecological functioning and current species richness. Past management practices affecting composition and structure are largely forgotten by employees of the administering agency. Collation of photos, remaining historic documents, and current databases identify many management activities that may have left their mark on the landscape. These include: homesteading (and concomitant disturbances), timber harvest, livestock grazing, fence construction, stockpond construction, road construction, scarification, prescribed fire, fire suppression, fertilization (aerial and ground-based), herbicide application (aerial and ground-based), and seed application. Over 50 non-native herbaceous species have been introduced to the CSNM through seed application. Repeat photos identify both change in woody species domination over time as well as examples of static vegetation composition and structure. Lack of change appears associated with either edaphic control (high clay or skeletal soils) or naturally high-fuel plant communities adapted to stand-replacement fire by resprouting. Change is associated with plant communities incorporating a greater portion of shrubs and trees regenerating from seed. Localized changes in ecological functioning are apparent as erosion gullies, slumping soils, and atypical patterns of vegetation change associated with type conversion and weed invasion.

Birefringence and Light Scattering Measurements in a Wormlike Micellar System, **COREY HOVEN[1], PANOS PHOTINOS[1], MARIA R. LOPEZ-GONZALEZ[2], and PAUL T. CALLAGHAN[2]** ([1]Department of Physics and Engineering, Southern Oregon University, Ashland, OR 97520; [2]MacDiarmid Institute for Advanced Materials and Nanotechnology, School of Chemical and Physical Science, Victoria University of Wellington, New Zealand; E-mail: hovenco@sou.edu).

We present light scattering and birefringence measurements in the micellar system 10% (weight by volume) of cetylpyridinuim chloride/sodium salicylate (molar ratio 2:1) in 0.5 M NaCl brine. This system is known to form wormlike micelles, and shows viscoelastic behavior. In particular, for shear rates above 3 s^{-1} the shear stress exhibits a plateau, attributed to shear banding and the appearance of shear-induced nematic order. We used a cylindrical glass cell with a gap of 1.5 mm, and measured the birefringence in the direction of the velocity gradient and the light scattered at 90° as the shear was turned on and off. Data were recorded for 30 seconds after turn off/on. The results show that as the shear is turned on, the transient behavior is rather complex and persists longer than the duration of the data acquisition run. The turn off behavior is considerably simpler, and characterized by a single relaxation time constant of about 300ms. The results are discussed in conjunction with recent NMR findings.

Structural Determination of Three Unknown Molybdenum Compounds — A Guided-Inquiry Based Laboratory Experiment for Inorganic Chemistry, **LAURA HUGHES** (Department of Chemistry, Southern Oregon University, 1250 Siskiyou Blvd., Ashland, OR 97520).

An exploratory experiment for the undergraduate inorganic laboratory involving the synthesis and characterization of three molybdenum coordination compounds is described. The compounds are synthesized on a microscale basis and their structures and formulas determined by infrared and visible spectroscopy, and confirmatory testing. Students are expected to use their

fundamental understanding of inorganic chemistry and the scientific method to achieve the goals of the laboratory experiment.

Setting the stage: Who were the first Ice Age people of the Pacific Northwest? **NINA G. JABLONSKI** (Department of Anthropology, California Academy of Sciences, 875 Howard Street, San Francisco, CA 94103; E-mail: njablonski@calacademy.org).

The mode and timing of the peopling of the Pacific Northwest remain controversial topics despite over a century of research. Evidence from archaeological, molecular, and linguistic sources now inclines toward a consensus that the colonization of this region by humans was accomplished via both coastal and hinterland routes between 13,000 and 11,000 years ago. The number of different waves of human migration into the region is still subject to debate, and it is likely that some of the populations involved in the initial settlement of the area became extinct. Humans occupying the environments of the Pacific Northwest encountered a rich resource base with many ecological opportunities, but also faced many unknowns and challenges that accompanied the occupation of an entirely new landscape, including new vegetation communities and predators.

Ice Age peoples of the Pacific Northwest and the Vitamin D Imperative, **NINA G. JABLONSKI** (Department of Anthropology, California Academy of Sciences, 875 Howard Street, San Francisco, CA 94103; E-mail: njablonski@calacademy.org).

The habitation of northeastern Asia, Alaska, and the Pacific Northwest in the terminal Pleistocene and Holocene necessitated many new cultural adaptations. One of the greatest challenges that faced the human occupants of high latitude environments was the maintenance of physiologically adequate levels of vitamin D. Vitamin D is necessary for the growth and maintenance of the skeletal system, and for proper functioning of the immune and nervous systems. Humans gain vitamin D primarily through biosynthesis in the skin and secondarily through diet. Vitamin D is formed in the skin following exposure to specific short wavelengths of ultraviolet radiation (UVR) in sunshine, namely UVB. Because northeastern Asia, Alaska, and the Pacific Northwest receive relatively little UVB because of their high latitude, humans living there cannot synthesize physiologically sufficient amounts of vitamin D in their skin throughout the course of the year. As a result, human habitation of the region has depended upon the inclusion in the diet of rich sources of vitamin D such as fish, marine mammals, and caribou. A vitamin-D-rich diet has permitted evolution of darker skin pigmentation than would be predicted for latitude as protection against high levels of longer-wavelength UVR (UVA) reflected from snow and ice.

High School, District and No Child Left Behind, **JACK JAMES** (Chemistry Instructor, South Medford High School, 815 S. Oakdale Ave., Medford, OR 97504).

An introduction to the requirements of the school, district, and teachers put in place by the No Child Left Behind (NCLB) Act of 2001. NCLB is the first step in improving school achievement. While many facets of the bill produce promising results others seem punitive to the school that is struggling to meet standards. This presentation will address the challenges associated with the implementation of a small-school model to satisfy the requirements of NCLB.

Diets and Technology for Survival in an Ancient Arid Land: The Paisley Caves 10,000 - 12,000 B.C., **DENNIS L. JENKINS** (Museum of Natural and Cultural History, 1224 University of Oregon, Eugene, OR 97403-1224; E-mail: djenkins@uoregon.edu).

Evidence accumulated at the Paisley Caves suggests that the first human colonists arrived in the Northern Great Basin between 16,000 and 12,000 calibrated years ago (cal. BP). The earliest sites are located near lakes and marshes and contain substantial quantities of waterfowl and fish bones in the oldest deposits. This pattern has suggested to some researchers a specialized lacustrine oriented settlement-subsistence pattern known as the Western Pluvial Lakes Tradition. Other researchers interpret the evidence to indicate a more generalist subsistence pattern. Clovis artifacts and sites indicate the Northern Great Basin was occupied by at least 13,000 cal. BP, what currently does not exist is irrefutable evidence of the exploitation of Pleistocene fauna. There is no logical reason that camelids, horses, bison, and mastodons would not have been hunted had they been available. The most reasonable explanation for the current lack of evidence for their exploitation by humans is that either they were already extinct prior to the arrival of humans, or their demise more or less co-occurred with the arrival of humans. This paper 1) explores the evidence for the dating and possible association of artifacts with megafauna and 2) presents new evidence for the technology (sewing) necessary to the colonization of North America from Siberia during the last glacial period.

*Comparative Phylogeography of Lahontan Cutthroat Trout (*Oncorhynchus clarki henshawi*) and the Paiute Sculpin* (Cottus beldingi*): A Step Towards Ecosystem Management in the Marys River Basin*, **THERESA JENKINS, GUY HOELZER, and MARY PEACOCK** (Department of Biology, University of Nevada, Reno, Reno, NV 89557; E-mail: jenkins5@unr.nevada.edu).

Conservation efforts aimed at a single species will inevitably affect co-distributed species. Therefore, it is imperative that species-specific conservation strategies understand how maintaining genetic diversity in one species

could affect diversity in other co-distributed species. Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*, LCT) is federally listed as threatened under the Endangered Species Act. Here we determine to what degree geographic patterns of genetic variation are correlated between the LCT and Paiute Sculpin (*Cottus beldingi*), in the Marys River Basin of Northeastern Nevada, to determine if conservation efforts aimed at maintaining genetic diversity in the LCT can protect diversity in other co-distributed species. To facilitate comparison between the species, we sampled the same twenty sites as those in the LCT study (Neville 2002); sculpin were collected by electro-fishing and fin clips were taken for DNA extraction. Sculpin were found in twelve of the twenty sites, and four genetically distinct populations were identified using nuclear microsatellites markers and the programs STRUCTURE and FSTAT. Two of the defined sculpin populations are congruent with those defined by Neville (2002), while the other two sculpin populations fall within a region with one defined LCT population. We hope this study will allow managers to develop conservation plans suitable to maintain genetic diversity for multiple taxa, taking managers in the direction of ecosystem management for the Marys River Basin.

Changes to Soil Chemistry by Application of Fruit Processing Liquids and Solids, **MITCHELL JOHNS** (Plant and Soil Science, California State University, Chico CA 95929-0310; E-mail: MJohns@csuchico.edu).

In 1999 research was initiated at a local fruit processing company to evaluate the changes occurring in their USDA Class III soils used for application of processing water and solids. The factory processes peaches, pears, grapes, and pineapples for canning, and irrigates adjacent cropland with waters containing high COD (10,000-14,000 mg/L) fruit constituents and sodium. About three million gallons of process water are applied daily during July-September to five field sites totaling 199 acres. Several tons of off-grade fruit solids are also applied daily. Soil (in one-foot increments down to four feet) and monitoring well were sampled bi-monthly and quarterly. After five years of application, COD constituents were labile and completely degraded in the soil. No soil organic carbon build-up was found. Although high levels of COD water and fruit solid were applied, no microbial induced acidification was found at any soil depth. Soil chemistry was influenced by the high sodium content of the water resulting in elevated soil pH and sodic levels. No deep leaching of soil nitrate and salt (electrical conductivity) was found. Soil nitrate was influenced by annual crop uptake and possible denitrification. No breakthrough of contaminants in well water was observed. Five-year trend lines of sodium were mostly not significant although soil sodium increased in many of the sites. Gypsum applications controlled the build-up of soil sodium. Exclusion of sodium in the factory processing is recommended. Future research will include soil solution sampling to detail soil chemical changes influenced by high COD, sodium, and microbial activity.

Crystal Engineering of Novel Chalcogenides: Films and Bulk, **DAVID C. JOHNSON** (Materials Science Institute, University of Oregon, Eugene, OR 97403; E-mail: davej@oregon.uoregon.edu).

The preparation of superlattice materials from initially layered reactants with atomic concentration profiles close to that of the desired compounds will be discussed. Annealing of this precursor results in the formation of the desired structure as it is the only kinetically accessible path for the system to lower its free energy at low temperatures. The driving force for this process is the free energy of crystallization of the component materials. TEM and diffraction data on the conversion of the as deposited films to the ordered products will be presented and a mechanism proposed. The synthesis of $(Bi_2Te_3)_x(TiTe_2)_y$. $(CrSe_2)_x(NbSe_2)_y$, $(WSe_2)_x(W)_y$ and $(VSe_2)_x(TaSe_2)_y$ superlattices will be presented, demonstrating respectively the ability to prepare a superlattice consisting of immiscible components, stabilizing a metastable structure via charge donation from the other component, the ability to prepare superlattices containing both van der Waal gap containing and 3-dimensional materials, and the ability to prepare superlattices between miscible components.

Small Mammal Communities in the Cascade-Siskiyou National Monument, **AARON JOHNSTON** (Oregon State University, Department of Fisheries and Wildlife, 104 Nash Hall, Corvallis, OR 97331-3803; E-mail: Aaron.Johnston@oregonstate.edu).

The Cascade-Siskiyou National Monument was recently established in recognition of the extraordinary biological diversity exhibited by this region where elements of the Cascade Mountains, Siskiyou Mountains, and the Great Basin mingle. Studies of small mammal communities within this region are limited and the potential diversity remains unclear. We distributed 16 Sherman-live trap grids (100 traps/grid) throughout the Monument in two forest types, oak-shrub and mixed-conifer, and trapped during the fall of 2003 and 2004. In addition, we distributed 20 small grids (15 traps/grid) throughout the Monument in a variety of habitats including spring seeps and open meadows. Eighteen species of small mammals were captured and we describe species richness, relative abundance, and micro-habitat associations.

Immortal Athletes: A Study of the Lifespan of World Class Athletes, **AMANDA C. JOHNSTON** (Livermore High School, Livermore, CA 94550; Email: pandabear@pipeline.com).

Athletes have long been thought of having long lifespans and good health. Do athletes really live longer then the general population? To determine the answer to this question, data

was collected pertaining to a total of 448 World Class Athletes born in the United States between the years of 1900 and 1920. The Excel™ database program was utilized to input data, calculate averages and other data analysis of the lifespan of both World Class Athletes and the general population. Data on the athletes were confirmed by a variety of sources. The average lifespan of the general population was determined from UC Berkeley's Center of Mortality Database. From this database, data on lifespan were taken for those in the general population that had reached 20 years of age, in order to eliminate childhood deaths in the general population. For people who lived to be at least 20 years of age, it was found that World Class Athletes live additionally an average of 10.3 years longer then the general population. Swimmers and divers lived the shortest of the athletes and tennis players and golfers lived the longest. In 1907 there was a 24.9% difference between the length of life of the general population and the World Class Athletes. In 1909, there was only a 7.28% difference between the average age of the athletes and of the general population. Variation in sport, data and error analysis, and recommendations for further study will be discussed.

Isolation and Characterization of Heterotrophic Bacteria at Blue Ledge Mine, **BRIANNA KARHU and KATHLEEN A. PAGE** (Southern Oregon University, Dept. of Biology, 1250 Siskiyou Blvd., Ashland, OR 97520; E-mail: Karub@students.sou.edu and page@sou.edu).

Acid Mine Drainage (AMD) is a serious problem currently plaguing the Blue Ledge Mine located in Siskiyou County, California. Bacteria are primarily responsible for AMD because they produce acid as a byproduct of the oxidation of pyrite caches, which is potentially pernicious to the surrounding ecosystem and watershed. Previous 16S rRNA gene cloning experiments on Blue Ledge Mine tailings have revealed great bacterial diversity including *Acidithiobacillus Leptospirillum*, and a novel assortment of *Bacillus* species; however, attempts to isolate bacterial specimens have resulted in abundant fungal growth. Based on these results, the objective was to isolate heterotrophic bacteria, particularly *Bacillus* and acidophiles, from mine tailings and snottite with the application of an antifungal reagent. Bacterial isolates were characterized according to colonial and microscopic morphology and various biochemical tests. Partial 16S rRNA sequences were obtained and used to determine their relatedness among bacterial sequences present in GenBank. Ten gram-positive isolates were recovered from mine tailings, six of these were *Bacillus*, and one *Bacillus* (P10) was authenticated to be novel and thus further characterized. Four isolates were acquired from snottite including two acidophiles with an optimum growth at pH 3.5. These encouraging results demonstrate that a diversity of bacterial species, including a novel *Bacillus* and a few acidophiles, can be successfully isolated from mine tailings and snottite. The culturing, isolation, and characterization of bacterial species present in AMD is vital to understanding AMD.

Analysis of Ancient DNA from an Individual from Prince of Wales Island: Implications for the Peopling of the New World, **BRIAN M. KEMP, DAVID GLENN SMITH, JASON ESHLEMAN, RIPAN S. MALHI, JOHN MCDONOUGH, E. DEBORAH BOLNICK, JAMES DIXON, TIMOTHY H. HEATON, TERENCE FIFIELD, and ROSITA WORL** (Molecular Anthropology Laboratory, Department of Anthropology, University of California, One Shields Avenue, Davis, CA 95616; E-mail: bmkemp@ucdavis.edu).

Ancient mitochondrial and Y-chromosome DNA were successfully extracted from the teeth of an individual dated to 9,880 ± 50 (CAMS- 32038) and 9,730 ± 60 (CAMS-29873) excavated from On Your Knees Cave (site 49-PET-408) on Prince of Wales Island in Southeast Alaska. ´^{13}C values of 12.1 and 12.5% suggest a diet of marine foods, so the date should be adjusted to c. 9,200 ^{14}C ybp. The mitochondrial DNA (mtDNA) of this individual belongs to haplogroup D and the Y-chromosome to haplogroup Q-M3*, which also confirms that the sex of the individual was male. This individual's mitochondrial haplotype (based on his hypervariable region I+II sequences) does not represent the basal haplogroup D lineage, demonstrating that multiple founder lineages of this haplogroup reached the New World. This haplotype matches or closely matches published sequences of Native American mtDNA found in populations of both North and South America, being found in approximately 1% of living Native Americans. The known date associated with this sample allows for the calibration of the molecular clock and can be used to assess the accuracy of earlier estimates of the timing of the peopling of the New World based on molecular diversity. This sample also establishes a minimum date for the emergence of the M3 Y-chromosome mutation, which is believed to have occurred early during the settlement of the New World.

Wave Force on an Ocean Current, **KERN E. KENYON and DAVID SHERES** (4632 North Lane, Del Mar, CA, 92014-4134; E-mail: kernken@aol.com).

Linear momentum of surface gravity waves changes with time during refraction by a horizontally variable current, as is predicted by ray theory; the momentum change per unit time requires a force by the current on the waves. According to Newton's third law, the waves apply an equal but opposite force back on the current. The wave force of linear waves on the current is calculated for a steady horizontal shear current and it is found to be directly proportional to the wave momentum times the shear in the current. For a current like the Gulf Stream it is theoretically possible for the wave force on the current to be as large as the Coriolis force on the current to the depth of wave influence; the effect on equatorial surface

currents is likely to be even more significant. Due to the reasonable conjecture that the orbital angular momentum of the waves cannot be exchanged with the current, the growth or decay of the wave amplitude in the shear current is computed as well. An exponential growth or decay of the amplitude is obtained with the e-folding scale being proportional to the current shear. A comparison between the calculated wave force and the Coriolis force for reported data describing the reflection of waves by the Gulf Stream is presented. The potential effects of the wave force on the surface extent of such currents and their observations by remote sensing, including possible bias in estimation of their transport capacity, are discussed. Instances of potential positive and negative feedback acting during the interaction between the waves and the current are outlined.

Soil Water Balance Dynamics in Two Semi-arid Shrub Communities: A Case for the Millet-Peanut Rotation System in Senegal's Peanut Basin, **F. KIZITO, M. I. DRAGILA, M. SENE, A. LUFAFA, R. CUENCA, J. SELKER and R. P. DICK** (Oregon State University, Department of Crop and Soil Science, ALS Building 3017, Corvallis, OR 97331; E-mail: fred.kizito@oregonstate.edu).

Soil water is a highly limiting resource in semi-arid regions that requires accurate assessment of the contributing fluxes to the profile for sound crop management. In Senegal, two widely established native shrub species occur in farmers' fields; *Guiera senegalensis* and *Piliostigma reticulatum*, whose hydrological impact on semi-arid farming systems remains an issue of scientific inquiry. The project sought to assess whether shrub communities in these farming systems impact the field water balance with respect to annual crop survival. Soil water fluxes among shrub species and in shrub-crop associations were evaluated using a novel combination of root sap flow techniques, soil moisture measurements and the Penman-Monteith approach. Within the 0.8 – 1.2 m depth range, shrub water consumption lowered soil water content levels by approximately 1.2 % compared to the plots without shrubs. Soil moisture increased with depth in the upper 0.8 m of the profile, inducing upward flow of soil moisture. Both shrub species where found to offer a facilitative hydrological impact on the annual crops; with greater profile recharge in the rain season and diminished soil evaporation below shrub canopies. We advocate the intercropping of annual crops with these shrub stands. The conventional practice of removal of these perennial woody components from this ecosystem, if not halted, could potentially reduce profile recharge while increasing runoff, surface soil temperature and soil evaporation, resulting in long-term detrimental impact to agricultural productivity.

Does a Newly Discovered Picornavirus Cause Diabetes? **WILLIAM KLITZ and BO NIKLASSON** (University of California, Berkeley, CA, and Apodemus AB, Stockholm, Sweden; E-mail: klitz@socrates.berkeley.edu).

A variety of evidence points to the role of Ljungan virus (LV), a recently discovered picornavirus, in diabetes and reproductive diseases. LV has been found in the native mammals of Sweden, and governs the population cycles of several rodent species in northern Sweden. LV is also present in North American rodents. In native voles and laboratory mice, LV causes a variety of symptoms mimicking T1D and T2D. Koch's postulates for pathogen transmission have been satisfied in laboratory mice. Antiviral therapy reduces the frequency of diabetes in lab mice.

In humans the incidence of new cases of T1D, gestational diabetes, preeclampsia and intrauterine fetal death (IUFD) in northern Sweden is correlated with rodent population cycles, showing that the attributable risk due to the underlying factor must be substantial. These diseases are found concurrently in individuals far in excess of random expectations. Antisera and IHC (immunohistochemistry) assays show an excess frequency of LV in T1D patients and LV in samples of IUFD from several organs and from placentas of women with preeclampsia, resp. RT-PCR confirms the presence of LV in preeclampsia placenta, and the IHC assay is positive for LV only in preeclampsia cases. A long-posited environmental cofactor of diabetes may finally be in hand.

Adaptive Searching in Spatially-Structured Systems: Applications from Microbial Ecology to Biodefense, **GUY R. KNUDSEN[1] and JAMES P. STACK[2]** ([1]Soil and Land Resources Division, University of Idaho, Moscow, ID 83844; [2]Department of Plant Pathology, Kansas State University, Manhattan, KS 66508; E-mail gknudsen@uidaho.edu).

Soilborne fungi perform beneficial roles such as remediation of soil pollutants and biological control of plant pathogens, but relatively little predictive information is available about their growth patterns in soil habitats. Fungal foraging behavior consists of hyphal segment elongation and branching; an optimal foraging strategy most efficiently partitions energy into long-distance searching (greater hyphal elongation) and local searching (more branching). However, optimization is complicated by the many possible three-dimensional spatial arrangements of target substrate units. This problem is representative of a class of search problems in which 1) targets are located in a multi-dimensional matrix, and, 2) target pattern varies from highly spatially structured (aggregated) to unstructured (random or uniform). An evolutionary programming approach was developed, in which the growth of large populations of hyphal segments in a soil volume was simulated using an individual-based computer model. Targets were either randomly distributed or highly aggregated within the simulated space. Individual hyphal segments passed on 'genotypes' controlling branching pattern to their progeny, and the fitness levels of different genotypes

(as expressed by resource acquisition) were proportionately represented in succeeding generations. Random genotypic variation was periodically introduced into the population. After several simulated generations, distinct optimal foraging behaviors emerged for aggregated and randomly distributed substrates. This adaptive approach may have utility for design of biocontrol strategies. The approach should prove useful for optimizing search behavior in other fields, for example scouting for introduced invasive organisms, whether naturally occurring or resulting from bioterrorism activity.

The New Guinea Singing (Wild) Dog, **JANICE KOLER-MATZNICK** (The New Guinea Singing Dog Conservation Society, 5265 Old Stage Road, Central Point, OR 97502; E-mail: jkoler@ccountry.com).

The New Guinea Singing Dog [NGSD] is a wild dog indigenous to the mountains of New Guinea. It was first described by E. Troughton in 1957 and named *Canis hallstromi.* Subsequently, other authors have designated the NGSD *Canis familiaris hallstromi*, *Canis familiaris dingo*, *Canis dingo*, *Canis dingo hallstromi*, or *Canis lupus dingo*. There are less than 50 highly inbred specimens currently in the documented captive breeding population. This canid has never been studied in the wild and virtually nothing is known concerning its behavior, social organization or general natural history under free-ranging conditions. From the few sightings reported in the literature, the NGSD appears to be rare in its native habitat, and to range from about 2,500 m up to 4,300 m in cloud forest, sub alpine and alpine habitats. V. Simonsen (1976) reported that NGSDs had 2 of 18 blood enzymes that matched coyote (*Canis latrans*) rather than domestic dog (*Canis familiaris*), Australian dingo or wolf (*Canis lupus*). Observations of specimens in the North American population have revealed that NGSDs possess several unusual and some unique behavioral characteristics compared to domestic dogs and wolves. Preliminary endocrine work indicates that female NGSDs have a unique (for canids) seasonal breeding cycle with repeated estruses. It now seems likely that the NGSD is not, as commonly assumed, merely a feral domestic dog. Wherever the NGSD ancestor originated, and whenever it arrived in New Guinea, today the NGSD seems to be a unique and highly endangered taxon, deserving of study and conservation.

Trend of Middle School Science Teachers' Assessment Practices in Their Classrooms: A Comparison Study Based on the Trend of International Mathematics and Science Study in 1995, 1999, and 2003, **MING-CHIH LAN and MIN LI** (College of Education, Box 353600, University of Washington, Seattle, WA 98195; E-mail: mclan@u.washington.edu and minli@u.washington.edu).

Recently assessment has become an increasingly essential element in educational reforms to improve learning and teaching (e.g., Baker, Linn, Herman, & Koretz, 2002; Linn, 2000; Shepard, 2005). Research has documented ample evidence on how teachers' classroom assessment practices, especially formative use of assessment tools, affect their students' learning as well as their own instructional decisions (e.g., Black & Wiliam, 1998a, 1998b; Natriello, 1987; Rosenshine & Stevens, 1986). This paper centers in the premise that assessment, in particular the assessment practices implemented by teachers, is an integral link in the chain of classroom teaching and learning.

We will report both how middle school science teachers conducted assessment in their daily teaching and how the trend of teachers' assessment practices has changed over the period of time using questionnaire data from the US samples collected by the Trend of International Mathematics and Science Study (TIMSS) in 1995, 1999, and 2003. Specifically, we will perform descriptive analysis to ascertain three main aspects of teachers' assessment practices: (1) types of assessment tasks used by teachers, (2) methods for interpreting and using assessment information, and (3) assessment purposes. We will also perform statistical modeling to correlate teachers' assessment practices with other variables, including assessment resources teachers drew upon, teachers' familiarity with national and state science standards, teachers' understanding of science content, etc., to understand how assessment practices are associated with those variables. Finally, we will present the trend of teachers' assessment practices captured by the three TIMSS cross-sectional studies.

History of the Long-term Lake Monitoring Program at Crater Lake National Park, Oregon, **GARY LARSON[1] and MARK BUKTENICA[2]** ([1]USGS Forest and Rangeland Ecosystem Science Center, 777 NW 9th Street, Suite 400, Corvallis, OR 97330; [2]Crater Lake National Park, PO Box 7, Crater Lake, OR 97604; E-mail: gary_l._larson@usgs.gov).

Crater Lake is located in the caldera of Mount Mazama in Crater Lake National Park, Oregon. The lake has a surface area of about 53km^2 at an elevation of 1882 m, and a maximum depth of 594 m. Studies of the deep-blue lake conducted from 1896 and 1970 were sparse and fragmented, but sufficient information had been collected to determine that the lake was deep, thermally stratified in summer, and unproductive, with Secchi disk clarity readings in the high 30-m range. Studies of the lake in 1978 - 1982 discovered Secchi disk clarity readings in the high 20 to low 30 m range. These shallow Secchi disk clarity readings suggested a decline of lake water quality. In response to this apparent change in water quality, Congress passed Public Law 97-250 in the fall of 1982 that directed the Secretary of the Interior to evaluate the water quality of the lake for 10-years. At the end of the project researchers concluded that the lake was in pristine condition, except for any impacts caused by introduced salmonids. Results of the initial studies were published as a final report

in 1993. The lake program continued in 1994 and additional funding for the long-term project was obtained in 1995. In addition to the normal long-term limnological monitoring, new studies of the lake were conducted such as special optical properties, algal nutrient limitations, pelagic bacteria, littoral zooplankton, and models of the inter-relationships of thermal properties, nutrients, and phytoplankton, deep-water mixing, and a water budget.

Predicting Secchi Disk Depth from Average Beam Attenuation: Towards a Solution to Surface Problems in Deep, Ultra-Clear Lakes, **GARY L. LARSON, ROBERT L. HOFFMAN, BRUCE R. HARGREAVES, and ROBERT W. COLLIER** (USGS-FRESC, 3200 SW Jefferson Way, Corvallis, OR 97331; E-mail: robert_hoffman@usgs.gov).

Secchi disk deployment for measuring water clarity should occur during midday under clear skies and calm-slightly rippled lake surface conditions. However, mountain lake environmental conditions can often be unacceptable for proper Secchi disk deployment. Also, human observer subjectivity and visual acuity can bias Secchi disk-derived water clarity estimates. Since a beam transmissometer (BT) is not subject to these potential sources of error, we investigated the use of BT measurements to estimate Secchi disk water clarity depth. Secchi disk depth (SD) and BT measurements were made at a designated sampling station on Crater Lake, Crater Lake National Park, Oregon, USA. SD measurements were made using a standard 20 cm black and white disk. The BT light source had a nearly monochromatic wavelength of 660 nm and a path length of 25 cm. Thirteen SD measurements recorded on days when environmental conditions were acceptable for disk deployment were used to calibrate a SD prediction model by regressing inverse SD (1/SD) against beam attenuation averaged over the same depth range as the measured SD (i.e., cp660avg). The relationship between 1/SD and cp660avg was significant ($P = 0.0015$; $r^2 = 0.62$). The average 95% confidence interval for predicted SD relative to measured SD was ±1.6 m or ±5.0%. Eleven additional SD measurements were used to test the accuracy of the model. The average 95% confidence interval for predicted SD relative to measured SD was ±0.7 m or ±2.8%. These results demonstrated that the prediction model could be used to reliably estimate SD.

Distribution and Abundance of Zooplankton Populations in Crater Lake, **GARY LARSON[1], C. DAVID McINTIRE[2], MARK BUKTENICA[3], SCOTT GIRDNER[3], and ROBERT TRUITT[4]** ([1]USGS Forest and Rangeland Ecosystem Science Center, 777 NW 9th Street, Suite 400, Corvallis, OR 97330; [2]Department of Botany and Plant Pathology, Oregon State University, Corvallis, OR 97331; [3]Crater Lake National Park, PO Box 7, Crater Lake, OR 97604; [4]National Park Service, 1512 East Main Street, Ashland, OR 97520; E-mail: gary_l._larson@usgs.gov).

The zooplankton assemblages in Crater Lake exhibited consistency in species richness and general taxonomic composition, but varied in density and biomass during the period between1988 to 2000. Collectively, the assemblages included 2 cladoceran taxa and 10 rotifer taxa (excluding rare taxa). Vertical habitat partitioning of the water column to a depth of 200 m was observed for most species with similar food habits and/or feeding mechanisms. No congeneric replacement was observed. The dominant species in the assemblages were variable, switching primarily between periods of dominance of *Polyarthra-Keratella cochlearis* and *Daphnia*. The unexpected occurrence and dominance of *Asplanchna* in 1991 and 1992 resulted in a major change in this typical temporal shift between *Polyarthra-K. cochlearis* and *Daphnia*. Following a collapse of the zooplankton biomass in 1993, *Kellicottia* dominated the zooplankton assemblage biomass between 1994 and 1997. The decline in biomass of *Kellicottia* by 1998 coincided with a dramatic increase in *Daphnia* biomass. When *Daphnia* biomass declined by 2000, *Keratella* biomass increased again. Thus, by 1998 the assemblage returned to the typical shift between *Keratella - Polyarthra* and *Daphnia.*

Kuhn Since Kuhn: A Study in the Evolution of Thomas S Kuhn's Philosophy of Science, **SEAN DERMOT LEHANE** (Institute for the History and Philosophy of Science and Technology,'Room 316, Victoria College, 91 Charles Street West, University of Toronto, Toronto, Ontario M5S 1K7 CANADA; E-mail: sean.lehane@utoronto.ca).

When people hear the words 'scientific revolution', 'paradigm' and''incommensurability', they think immediately of Thomas Kuhn and his *The Structure of Scientific Revolutions* (1962). He is the historian of science who popularized the notion that science progresses by means of occasional revolutions in individual paradigms (fields), not by means of continual accretion of knowledge. For those who either support or criticize his assertions, this brief summary tends to serve as the final word on his research programme. What people are unaware of is that his views on all of these concepts changed dramatically from the time of the first publication of *Structure* in 1962 through to the end of his life in 1996. In major collections such as, *Criticism and the Growth of Knowledge* (1970), *The Essential Tension* (1977) and *The Road Since Structure* (2000), as well as in various papers, Kuhn responds directly to his critics (most notably Lakatos, Feyerabend, Toulmin, Watkins, Popper, et al) continually rephrasing and re-explaining his beliefs. But he is not merely using different words to repeat the same thoughts; he is fundamentally reshaping his research programme. In this paper I examine how his belief in paradigms, revolutions and normal science morphed over a period of 30 years into theories

by the same names but of different substances. I provide critical analysis of his work as he left it to see if it is any more or less applicable today than it was when he began his career.

Validating the link between Knowledge and Science Test Items by Examining Test Takers' Talk-Aloud Verbalizations, **MIN LI and SHIN PING TSAI** (College of Education, BOX 353600, University of Washington, Seattle, WA 98195; E-mail: minli@u.washington.edu).

Currently testing is considered an essential drive in educational reforms in response to national and international priorities and challenges (e.g., *Benchmarks for Science Literacy*, AAAS, 1993). While assessment has become more sophisticated, a fundamental question remains surprisingly untouched: what do these test scores tell us about students' understanding? This paper addressed the validity of interpreting science test scores by examining how science items evoked different types of knowledge applied by participants while responding to those items. We proposed a theoretical framework to conceptualize science achievement as four interdependent types of knowledge: declarative (knowing that), procedural (knowing how), schematic (knowing why), and strategic (knowing about knowing) (e.g., Li & Shavelson, 2001). Using science items classified as measuring certain types of knowledge after we performed a cognitive analysis of item characteristics and a statistical analysis of item scores, we conducted talk-aloud interviews with a sample of participants and then analyzed transcribed verbalizations to capture the distinctive features of participants' cognitive activities. We found that participants applied the posited type of knowledge in responding to the science items which were pre-classified as particular knowledge types. The results also indicated that participants' use of knowledge was associated with important item characteristics. To conclude, this study empirically supported the framework for science achievement. We believe it is valuable to implement such a framework to scrutinize what is measured in science tests. This proposed framework provides not only accurate interpretations of students' test scores but meaningful insights for teachers to develop and evaluate assessment items.

Misfit Layer Compound$(Bi_2Te_3)_X$ $(SnTe)_Y$ as a Thermoelectric Material, **SISSI L. LI, MARY SMELLER, NGOC NGUYEN, and DAVID C. JOHNSON** (University of Oregon, Department of Chemistry, Eugene, OR).

We have targeted the synthesis of a series of $(Bi_2Te_3)_X(SnTe)_Y$ superlattice compounds to study the properties of misfit layer compounds as thermoelectric materials. Misfit layer compounds generally contain interwoven blocks of layered compounds (typically dichalcogenides) with a rock salt structure. Examples include $(NbS_2)_2(CeSe)_{1.16}$ and $(PbSe)_{1.10}(NbSe_2)$. Using modulated elemental reactions, we have recently had success preparing $(NbSe_2)_A(CeSe)_B$ with $4<A<10$ and $1<B<4$. This poster extends those previous studies to the $(Bi_2Te_3)_X(SnTe)_Y$ system. Structure and property studies as a function of layer thickness, annealing temperature and time, X, and Y will be presented.

Carbon Stocks and Patterns in Native Shrub Communities of Sénégal's Peanut Basin, **A. LUFAFA, I. DIÉDHIOU, S. NDIAYE, M. SÉNÉ, M. KHOUMA, F. KIZITO, R.P. DICK, and J.S. NOLLER** (Crop and Soil Science Department, Oregon State University, 3017 ALS Building, Corvallis, OR 97331; E-mail: abel.lufafa@oregonstate.edu).

Accurate and reliable estimates of carbon (C) storage in landscapes is critical to the development of effective policies and strategies to mitigate atmospheric and climate change. Carbon stocks of two native woody shrub (*Guiera senegalensis* J.F. Gmel and *Piliostigma reticulatum* (DC.) Hochst) communities and associated soils within Senegal's Peanut Basin were determined and the spatial structure of soil C quantified. These shrubs are of interest because they dominate semi-arid sub-Sahalien Africa and commonly coexist with row crops but have been largely overlooked as a key vegetative component of this landscape. Peak season shrub biomass C was measured in forty-five 0.81 ha plots at 8 locations using allometric relationships along with soil sampling (0 to 40 cm depth) and analysis for organic C and bulk density. Soil samples to a depth of 20 cm were taken every two meters in 24 x 20 m grids and every 0.5 m in four nested 3 m x 3 m grids containing at least one shrub or tree canopy and geostatistical techniques used to quantify scale and degree of soil C spatial dependence. Estimates of peak-season biomass C ranged from 0.9 Mg C ha^{-1} to 1.4 Mg C ha^{-1} with an overall mean of 1.12 Mg C ha^{-1} (SEM =0.079) in the *G. senegalensis* sites and from 1.3 to 2.0 t Mg C ha^{-1} (mean = 1.57 Mg C ha^{-1} ; SEM = 0.18) in the *P. reticulatum* communities. The overall mean of SOC to 40 cm was 17 and 17.2 Mg C ha^{-1} respectively, at the *G. senegalensis* and *P. reticulatum* sites with 57% of that C residing in the top 20 cm. Semivariograms of soil C showed moderate spatial dependence and spatial autocorrelation at distances of less than 0.56 and 1.34 m at the *G. senegalensis* and *P. reticulatum* sites, respectively. Comparison across the different grids showed that the presence of shrub canopies at either site had much closer relationship to soil C levels than trees.

A Contribution to Our Knowledge About the Arthropods of Crater Lake National Park, **RONALD W. LYONS** (P.O. Box 127, Bandon, OR 97411; E-mail: pondhawk@uci.net).

Personal visits to a number of natural areas, including many National Parks, in recent years revealed that the information available to visitors about local arthropods was very limited or nonexistent in most cases. Experience at one National Park showed that some information did exist but it

was not consolidated and hence not readily accessible. Subsequent work revealed that a significant portion of published information was not known at the Park level. The effort to consolidate this information was discussed in general terms in Lyons "Web Site for Local Arthropod Information" (Proceedings of the Sonoran Arthropod Studies Institute 2003 Invertebrates in Captivity Conference; pp. 140-143).

In this presentation, the status of an on-going project to consolidate the arthropod information for Crater Lake National Park is discussed. This project has two aspects. The first involves documenting archival material such as journal articles, theses, and other papers which refer to arthropod activities in the Park or use specimens collected there. It also involves documenting the specimens collected in the Park but held off-site in the Oregon State University Arthropod Collection (OSAC), probably the largest off-site repository of Crater Lake specimens. The second aspect involves the preparation of a Park-specific guide with pictures and information about a representative sample of arthropods for use by Park visitors and staff. The information already gathered is structured as a local web site on simple web pages and will be available for viewing.

The New Ethnobotany: Complexities of Commerce and Health, **BARBARA YABLON MAIDA** (Department of Geography, University of California, Los Angeles, Los Angeles, CA 90095-1524; E-mail: bymaida@ucla.edu).

Changes brought about by steady regional development, whether in California's agricultural centers, or the settled areas west of the Mississippi, are the result of a long chain of decisions. Natural and environmental science, and public health each possesses a set of whole systems perspectives; the nexus of these disciplines relies on human behavior and decision-making to clarify system processes. Examples of short-term, and hence unsustainable, natural resource management have been addressed in such areas as agricultural land conversion and biodiversity depletion. One may examine geographic aspects of the ecological model and ultimate usefulness for informing research on medical topographies. In the twenty-first century, the convergence of seemingly disparate knowledge systems—ethnobotany, economics, and biotechnology—mingle place, movement of commodities, and genetics. In the past, studies of horticultural advancement and policies of possession and control revealed analogous processes; an analysis of more current phenomena needs to move beyond stories of empire building. Contemporary bioprospecting, harvesting and transfer of plant species impact physical and cultural landscapes and cannot be explained simply by taxonomies, domestic cultivation, and plantation economies. The current system is more complex, as plant extracts are processed and distributed as global commodities. One needs to re-examine asymmetrical relationships in land use, soil profiles, and plant genetics, as well as cultural knowledge. Although there is historical precedent for this process of global extraction and commoditization, and a multitude of cases, this project explores the networks of horticulturalists in the realm of *pharma*, albeit in the context of the "global commons."

Science as Narrative: Perspectives on Sustainability in the Social Sciences, **CARL A. MAIDA (**University of California, Los Angeles, Box 951668, Los Angeles CA 90095-1668; E-mail: cmaida@ucla.edu).

Humanistic perspectives are becoming more a part of recent scientific culture. Oral histories of scientific discoveries, including videotaped interviews, record scientists in conversation about the events and circumstances surrounding their work. Storytelling in science typically relies on personal narratives that weave together many threads of the discovery process, including intuition, creativity, curiosity, and social relationships underlying scientific breakthroughs. Ethical case studies of both laboratory and field-based scientific practice have promoted a value-centered dialogue in the clinical sciences, engineering, biotechnology, toxicology, and epidemiology among others. Social and cultural studies of science report on the actors, networks and organizations that frame scientific practice using ethnographic perspectives and tropes. In a manner quite different from the jargon-laden, and often depersonalized, peer-review literature that records progress in science, humanistically informed media introduce alternative habits of mind, such as context, critical thinking, and flexibility of perspective. Humanistically informed social scientists have recently become interested in "sustainability," a scientific concept linking principles of ecology and economics, physical-chemical laws governing the biosphere and the quality of life. The concept of sustainability holds that these social, economic, and environmental factors within human communities must be viewed interactively and systematically. Drawing from a variety of sources, including ethnographies, legal and policy briefs, and critical essays that frame sustainability in humanistic terms, this paper will discuss the various ways that social scientists have interpreted a key scientific concept.

Mitochondrial DNA Evidence for a Prehistoric Population Intrusion into the Pacific Northwest, **RIPAN S. MALHI** (Molecular Anthropology Laboratory, University of California, Davis, CA 95616; E-mail: ripan@tracegenetics.com).

The mitochondrial DNA (mtDNA) haplogroups of 54 fullblooded modern and 64 ancient Native Americans from northwestern North America were determined. The control regions of 10 modern and 30 ancient individuals were sequenced and compared with existing data. Within the Northwest, the frequency distribution for haplogroup A is geographically structured, with haplogroup A decreasing with distance from the Pacific Coast. The haplogroup A distribution

suggests that a prehistoric population intrusion from the subarctic and coastal region occurred on the Columbia Plateau in prehistoric times. Overall, the mtDNA pattern in the Northwest suggests significant amounts of gene flow among Northwest Coast, Columbia Plateau, and Great Basin populations.

The Science of Anthropology: Cultural Patterns and Their Neurological Correlates, **ROBERT F. MANLOVE** (St. Mary's College of California and City College of San Francisco; mailing address: 1064 Viela Court, Lafayette, CA 94549; E-mail: eosforos@silcon.com).

The analysis of cultural narratives from cultures around the world has shown that (1) a limited number of psychosocial concerns (needs, drives, motives) exist upon which culture is everywhere built and (2) there are universal patterns that govern the way human beings address these concerns. These concerns and patterns are explained and demonstrated here with examples from diverse cultures. The logical consequences of the concerns and patterns are presented and, in particular, it is shown how they combine to construct culture by producing values, beliefs and belief systems. Next, to explain the universality of the concerns and patterns, a reductive naturalist approach is taken and correlations in neurological activity are shown. A clear brain-culture connection is demonstrated by using direct neurological observation, brain tumor evidence, brain lesion evidence and brain imaging studies. Lastly, the significance of the concerns and patterns to anthropology is explored. Of greatest importance, a new field methodology is validated for the systematic determination of a culture's values, beliefs, and belief systems. Hence, it is suggested that a scientific basis for anthropology can be constructed and, with this approach, the discipline can be enabled to contribute more effectively to understanding and solving world problems.

WISE Project – An Innovative Approach to Water Management for Agricultural and Instream Needs, **STEVE MASON** (WISE Project Program Manager, 1678 Ashland Mine Road, Ashland, OR 97520; E-mail: smason@wiseproject.org).

The Water for Irrigation Streams and Economy (WISE) Project is being proposed to address the problems of unreliable irrigation water supplies and degraded water quantity and quality for native anadromous salmonids in the Bear Creek and Little Butte Creek watersheds by improving irrigation reliability and aquatic habitat in an economically and environmentally feasibly manner. Current regional water supply issues pose threats to the region, including, 1) high water loss to Irrigation Districts and water users due to an aging and increasingly inefficient water delivery infrastructure, 2) water scarcity due to full appropriation, if not over-appropriation, of water in Bear Creek and Little Butte Creek, which threatens the reliability of the irrigation water supply for Talent Irrigation District, Medford Irrigation District, and Rogue River Valley Irrigation District, 3) degraded water quality and water quantity for anadromous salmonids and other species, 4) potential water quality and reliability issues for Medford municipal water customers due to degraded water quality at the Robert Duff Water Treatment Facility on the Rogue River during summer months, 5) high temperature discharges to the Rogue River from the Medford Regional Wastewater Reclamation Facility, and 6) decreased aesthetic and recreation values of reservoirs, streams, and rivers from increasing stream and river withdrawals and decreasing reservoir levels.

The WISE Project is a proposed solution to the above problems. By addressing the needs of the system, the WISE Project aims to create a stable, long-term water supply system for the Rogue Valley.

The presentation will discuss the history of the project from its inception over six years ago as well as the goals of the project and the pathway that we are taking to reach them. The audience will be encouraged to offer ideas and input to these issues.

Long-term Tillage and Nitrogen Fertilization Impact on Soil Microbial Biomass, **J. E. MATOCHA** (Texas Agricultural Experimental Station, Texas A&M University, 10345 Agnes, Corpus Christi, TX 78406-1412; E-mail: j-matocha@tamu.edu).

The soil physical environment interactions with biological and chemical transformation affect indigenous soil and fertilizer N, which can alter N use efficiency by crops. Long-term tillage and N fertilization studies evaluated no-till (NT), minimum till (MT) and conventional till (CT) systems under N rates of 0, 22 and 67 kg N ha^{-1} for effects on soil microbial biomass C (SMBC) and N (SMBN) and mineralizable C and N in a long-term corn-cotton rotation. The Victoria clay (fine hyperthermic montmorillonitic Pellusterts) was sampled at three soil depths and at cotton planting, flowering and harvest. Microbial biomass C was greatest under MT and 0 to 20-cm depth at planting because of crop residue accumulation. The NT system maintained higher SMBC as the season progressed. Decreasing labile C substrate quality and availability caused a decrease in SMBC and SMBN through the season. Mineralizable N was highest in NT only in the surface layer in all fertilizer N regimes. Inorganic N was highest at planting in NT and in MT at flowering. Mineralizable C, and inorganic N were increased by N fertilization in all tillage systems.

A Geochemical Analysis of Serpentine Soils for the Reintroduction of San Francisco Owl's Clover, **ANDREW MATTHEW and MATTHEW J. LAFORCE** (San Francisco State University, 1600 Holloway Avenue, San Francisco, CA 94132; E-mail: amatthew@lowney.com).

San Francisco Owl's Clover (*Triphysaria floribunda*), is an endangered species endemic to serpentine habitats that was

recently discovered growing within the Presidio, CA. In this study, we assessed serpentine soil characteristics associated with the Owl's Clover and statistically compared its geochemical signature to soils targeted for Owl's Clover reintroduction. We divided the serpentine prairie into three sites (Site 1, 2, and 3) based on their physicochemical properties and analyzed them for the following serpentine indicators: Co, Cr, Cu, K, Mn, Ni, Zn, and Mo, Ca/Mg ratios, and pH. Average concentrations (n=15) for the Owl's Clover site (Site 1) were: Co (19.76 ± 6.51 mg/Kg), Cr (511.06 ± 134.92 mg/Kg), Cu (18.65 ± 1.87 mg/Kg), K (9788.24 ± 1158.60 mg/Kg), Mn (802.24 ± 101.58 mg/Kg), Ni (194.41 ± 149.42 mg/Kg), Zn (76 ± 6.46 mg/Kg), and Mo (5.06 ± 1.43 mg/Kg). Average Ca/Mg ratios were 1.17 ± 0.35 and pH was 6.48 ± 0.36. ANOVA in conjunction with a Tukey-Kramer honestly significant difference test revealed that Ca, Cr, Mg, Fe, and Mo concentrations were statistically ($p<0.05$) similar across the three sites. However, soils that currently support Owl's Clover had elevated concentrations of Co, Cu, Mn, P, and Zn and lower concentrations of Ni and Pb, which were statistically ($p>0.05$) different from the other sites. Consequently, based on the physicochemical and geochemical signatures of the soil we recommend that sites 2 and 3 not be used for the restoration of Owl's Clover.

Ferroelectric Behavior of $YMnO_3$, **JASON MATTHEWS, MICHAEL ANDRUS, PETER WU, PANOS PHOTINOS and SIDNEY C. ABRAHAMS** (Department of Physics and Engineering, Southern Oregon University, Ashland, OR 97520; E-mail: matthewsj@students.sou.edu).

The structure and dielectric behavior of RMnO$_3$ materials (R = Rare Earth element) have been the subject of several investigations in recent years. Bertaut and coworkers (*Compt. Rend*. **256** 1958 (1963)) first reported ferroelectric behavior in some RMnO$_3$ members. More recently, Yoshimura *et al.* (*Appl. Phys. Lett.* **73** 414 (1998)) reported an unsaturated hysteresis loop from a thin film of YMnO$_3$ deposited on a Si substrate. We present results that exhibit a wide and rather rectangular hysteresis loop on a 0.5 mm thick ceramic sample of YMnO$_3$ that unambiguously establishes the ferroelectric property of the material at room temperature. Our measured P_s value is consistent with the results of Yoshimure *at al.* however, we did not find any features corresponding to the phase transition at 913 K predicted by Bertaut and coworkers. We report x-ray diffraction, dielectric and calorimetric data to elucidate the crystal structure, phase transitions and high temperature dielectric properties of YMnO$_3$.

Research supported by the National Science Foundation, grant DMR-0137323.

*Sequencing and Characterization of the Alpha Hemoglobin Gene in Elk (*Cervus elaphus canadensis*), and Comparison to Alpha Hemoglobin of the Black Bear (*Ursus americanus*),* **HEATHER L. MATTSON and DAVID K. OLINE** (Biology Department, Southern Oregon University, 1250 Siskiyou Blvd., Ashland, OR 97520; E-mail: mattsonh@students.sou.edu).

Hemoglobin is a tetrameric blood protein responsible for oxygen transport in the bodies of many organisms. Subtle differences in the amino acid composition of the hemoglobin subunits make its properties somewhat unique to a species or family. Based on the molecular weights and chemical properties of the alpha and beta subunits, researchers have been able to determine the species the protein originated from (Espinoza et al, 1996). On occasion two unrelated species will coincidentally have hemoglobin proteins with identical molecular weights. This prevents them from being distinguished using standard chemical methods such as mass spectrometry. Scientists at the National Fish and Wildlife Forensics Laboratory have continually fought this problem when attempting to distinguish between the blood of black bears (*Ursus americanus)* and elk (*Cervus elaphus canadensis*) (Espinoza et al, 1999). In this study the gene coding for alpha hemoglobin in elk was sequenced in order to gain information about the primary structure of the protein it codes for. The completed 634 bp gene was translated into a protein containing 142 amino acid residues. This information has allowed the alpha hemoglobin subunits for bear and elk to be compared on a deeper level than was previously possible. Further scrutinizing of the results may allow chemical tests to be devised which could be used to easily distinguish between the two blood types.

A Spatial Investigation of Bio-Available Phosphorus in Submerged Wetland Soils, **J.J. MAYNARD, A.T. O'GEEN, and R.A. DAHLGREN** (Land, Air and Water Resources, University of California, Davis, One Shields Avenue, Davis, CA 95616; E-mail: jjmaynard@ucdavis.edu).

Irrigation induced erosion is one of the leading sources of pollution affecting water quality in the San Joaquin River (SJR). A major portion of phosphorus loading in agricultural watersheds is sediment-bound, due to sorption processes. Current Total Maximum Daily Loads (TMDLs) for phosphorus are based on total phosphorus concentrations which fail to accurately represent the bio-available fraction responsible for impaired water quality. This study examines the spatial relationships between wetland soil properties and their effects on the bio-availability of phosphorus. Two constructed wetlands were monitored during the 2004 irrigation season. Soil and sedimentation samples were collected throughout each wetland and analyzed for carbon, nitrogen, phosphorus, particle size, soil organic matter (SOM), crystalline and poorly crystalline iron- and manganese-oxides, phosphorus sorption index (PSI), water extractable P, and P extraction with Fe oxide paper (P_i test). Preliminary data show that sediment and nutrient loads were consistently lower at the outlets with maximum removal efficiencies of 97% for TSS, 44% for TN, and 71% for TP. Geostatistical analysis

was performed to determine the spatial variability for each soil property and to determine which properties best explained the variability of bio-available P after accounting for the effects of spatial autocorrelation. Phosphorus had the highest partial correlation with clay sized particles. Moreover, autocorrelation in spatial patterns demonstrated that concentration of total phosphorus and clay are highest at the inlet, decreasing with distance along the flowpath. Flowpath appears to play a major role in the spatial distribution of bio-available phosphorus.

Does Serpentinite Mineralogical Variation Affect Clay Mineralogy, Soil Mineralogical Class, and Ca:Mg Ratios? **DONALD G. McGAHAN, RANDAL J. SOUTHARD and VICTOR P. CLAASSEN** (Department of Land, Air and Water Resources, Soil Science Graduate Group, University of California, Davis, Davis, CA 95616; E-mail: soilman@ucdavis.edu).

What is nominally referred to as serpentinite often has a range of accessory minerals (talc, chlorite, pyroxene, feldspars, olivine) due to variable hydrothermal alteration and/or composition of the parent material. These accessory minerals vary in their susceptibility to weathering and ultimately affect soil properties. Serpentinite derived soils are of interest for their unique edaphic qualities (associated metals and low calcium) making them valuable as natural end-members of adverse conditions in ecological, agricultural and reclamation studies. We hypothesized that soils formed on what is nominally referred to as serpentinite vary as a result of variability in the parent material. Eleven pedons have been sampled from Henneke soil series (Clayey-skeletal, magnesic, thermic, Lithic Argixeroll) map units from California. The soil extractable Ca:Mg ratios range from 0.01 to 1.5. Total elemental analysis of the parent materials from these profiles range greatly in total concentrations of Al2O3 (0.3-15%) , CaO (0.02-23%) , MgO (5-36%), and Fe2O3 (8-20%). We use optical mineralogy and X-ray diffraction to identify accessory mineralogy that may be responsible for soil Ca:Mg variability.

Discipline Founding—A Coming to Be: The Disparate Cases of Marine Microbiology and Dendrochronology, **DONALD J. McGRAW** (824 Southshore Drive, Chula Vista, CA 91913; E-mail: granttree@yahoo.com).

Aristotle's argument that the 'coming to be' of something required two things: an agency for its generation, and a predecessor entity. So it may also be the case that with the coming to be of scientific disciplines some agency, possibly in the form of a single creative person, as argued in this study, represents the first aspect of Aristotle's dictum. The second aspect may be that those disciplines were built not necessarily'*de novo*, but were based upon one form or another of some preceding thing. The case of the 'coming to be' of the disciplines of marine microbiology and of dendrochronology (tree-ring science) represent two disparate cases of discipline founding. In the first disciplinary example, marine microbiology, the''coming to be' demonstrates clearly Aristotle's demand of its coming 'from something'—a broader notion that bacteria and kindred microbes of the sea might best be studied based upon their niches in the ecosystem and therefore studied within a unified discipline that could arise from something larger: general microbiology. While bacteriology and microbiology, as terms, have their own curious definitional histories and baggage, neither represents an area for much dispute when field comparisons comes to the fore: bacteriology cannot be confused with, for instance, zoology (though 'microbiology' is somewhat more problematical). The case of dendrochronology, on the other hand, borders on defying Aristotle's view (the second aspect) as it essentially came to be *de novo*. These two disciplines represent areas that can be studied profitably as exemplars of the more generalized question of how scientific disciplines come to be, and that is what is done in this paper.

Seasonal and Interannual Variability in the Taxonomic Composition and Production Dynamics of Phytoplankton Assemblages in Crater Lake, Oregon, **C. DAVID McINTIRE[1], GARY L. LARSON[2], and ROBERT E. TRUITT[3]** ([1]Department of Botany and Plant Pathology, Oregon State University, Corvallis, OR 97331; [2]U. S. Geological Service, Forest and Rangeland Ecosystem Science Center, 777 9th Street, Suite 400, Corvallis, OR 97331; [3]National Park Service, 1512 East Main Street, Ashland, OR 97520; E-mail: saxojazz@comcast.net).

Taxonomic composition and production dynamics of phytoplankton assemblages in Crater Lake, Oregon, were examined between 1984 and 2000. An analysis of 690 samples on 50 sampling dates from 14 depths in the water column found a total of 163 phytoplankton taxa. Dominant species by density or biovolume included *Nitzschia gracilis, Stephanodiscus hantzschii, Ankistrodesmus spiralis, Mougeotia parvula, Dinobryon sertularia, Tribonema affine, Aphanocapsa delicatissima, Gymnodinium inversum*, and *Peridinium inconspicuum*. When the lake was thermally stratified in late summer, some of these species exhibited a stratified vertical distribution in the water column. The maximum chlorophyll concentration when the lake was thermally stratified in August and September was usually between depths of 60 m and 120 m, whereas the depth of maximum primary production ranged from 60 m to 80 m at this time of year. Regression analysis detected a weak negative relationship between chlorophyll concentration and Secchi disk depth, a measure of lake transparency. However, interannual changes in chlorophyll concentration and the species composition of the phytoplankton could not be explained entirely by the removal of the septic field near Rim Village or by patterns of upwelling from the deep lake. An alternative trophic hypothesis proposes that the productivity

of Crater Lake is controlled primarily by long-term patterns of climate change that regulate the supply of allochthonous nutrients.

The Saga of the Ice Ages: Is the Next One Overdue? **ADEN B. MEINEL and MARJORIE P. MEINEL** (retired, University of Arizona, Tucson, AZ and Jet Propulsion Laboratory, Pasadena, CA; current address: 1600 Shoreline Drive, Santa Barbara, CA 93109; E-mail: ameinel@earthlink.net).

Our involvement in this ongoing saga arose from reading a paper in the AAAS's SCIENCE magazine. We didn't just decide to explore the history of the Ice Ages. It happened just when the time was right.

Many questions are now being asked about what is happening in our environment. So it's natural to look back to see what has happened to our environment in early times. The Earth bears evidence of major changes as can be seen in the scars left by the glaciers that are vanishing from our view. Ice cores drilled in the Greeland Plateau and Antarctica tell the same story: severe changes in the temperature of the environment have repeatedly occurred.

These ice cores recorded several ice ages during the last several hundred thousand years. The deep ocean cores show that ice ages have been recurring events as far back as the record can be read. Our involvement began when we suspected that the high resolution ice core from Greenland showed features that suggested to us astronomers as being the signatures of abrupt changes in solar luminosity. But the Sun is considered to be a well-behaved star. It hasn't shown any significant change in brightness since astronomers have been watching it. But has that always been the case?

Our adventure soon expanded to a new plateau: do solar class stars show any evidence of changes in brightness? Here we turned to the observations of the Hipparcos satellite, a project that we became involved with 20 years ago. Does it show any solar class star changing its brightness enough to lead to ice ages on any planets that might be circling those stars? Tonight we will take you on this adventure, not as a finished story, but as an on-going adventure.

Challenges of Presenting a Significant Laboratory Experience in the Secondary Classroom, **RICHARD O. MIKULA** (Instructor of Chemistry, Ashland High School, 201 S. Mountain Ave., Ashland, OR 97520).

There are significant constraints for the high school chemistry teacher attempting to provide a rich laboratory component in the classroom. Most of all, the issue is time: time to prep, time to maintain inventory of chemicals and equipment, time to grade, and time to manage wastes. With as many as 200 chemistry students, the high school chemistry teacher is attempting to survive, let alone be creative. Basic differences in pedagogy emerge. Should the curriculum let the laboratory experience drive the theoretical content; or, should the teacher prepare students to be well grounded in theory prior to laboratory experimentation? Also, there is currently a fundamental debate underway as to the need for inquiry-based experimentation versus the traditional method of structured labs. If a school is not on "block schedule", how can a teacher segment more complex labs that require longer laboratory sessions? Demos, labs and other ideas will be shared during the session. Adequate time for discussion will be included. Be prepared to offer your knowledge, perspective and suggestions to the group. Bring several copies of your favorite, short lab activities.

Using Macroinvertebrates as a Rapid Assessment Technique for Determining Soil Quality, **EMILY A. MILLER and STEPHEN P. ANDREWS, JR.** (Environmental Sciences Teaching Program, University of California, Berkeley, 301 Campbell Hall, Berkeley, CA 94720; E-mail: eamiller@berkeley.edu).

Assessment of soil quality is an emerging concern around the world. Current methods for determining soil quality require extensive field sampling and detailed laboratory analysis that can be time-consuming and costly for landowners. This study extends the principles of bioassessment using macroinvertebrates presently employed to gauge the relative health of streams as the basis for a new technique for the rapid determination of soil quality. Three 30 m transects established in the uplands of the Dow Wetland Preserve (Antioch, CA) were instrumented with temperature and moisture sensors placed at 15 cm above the soil surface in various forms of mulch (-15), at the soil surface (0), and at 15 cm into the soil profile (+15). Samples, measuring 215 cm^3, were taken at random intervals from each transect each week during the raining season. Collected samples were placed in a Berlese apparatus and exposed to constant light and heat. The diversity and abundance of macroinvertebrate taxa was then determined to create an relative index of soil quality. Preliminary results suggest that transects enriched with organic matter (mulch) showed greater diversity and complexity within the macroinvertebrate community. Additional field study is needed to arrive at workable relative index for soil quality using macroinvertebrates.

Image-based Nanocrystallography, Discrete Atomic Resolution Electron Tomography, and Tilt Protocol/Lattice-fringe Fingerprinting, **PETER MOECK[1], BJOERN SEIPEL[1], WENTAO QIN[2], ERIC MANDELL[3], and PHILIP B. FRAUNDORF[3]** ([1]Department of Physics, Portland State University, P.O. Box 751, Portland, OR 97207-0751; [2]Freescale Semiconductors™; [3]University of Missouri at St. Louis, St. Louis, MO; E-mail: pmoeck@pdx.edu).

To satisfy the projection theorem for crystalline samples, Z-contrast imaging in a scanning transmission electron microscope (Z-STEM) is frequently employed for standard electron tomography. There is, however, a strong electron

channeling effect in Z-STEM images whenever a crystal is transmitted along a low indexed zone axis. This channeling results in image intensities that are much higher than those of the other tomograms in the set so that such images are discarded in standard Z-STEM tomography. It is, however, exactly these low-indexed zone axis Z-STEM images that form the backbone of image-based nanocrystallography by means of transmission electron goniometry (IBN-TEG, P. Moeck et al., Mat. Res. Soc. Symp. Proc. 818 (2004) M11.3.1 & 839 (2005) P4.3.1). Due to symmetry constraints of the crystalline sample, a combination of transmission electron goniometry and discrete atomic resolution tomography by means of electron exit wave reconstruction (DET-EWR, J.R. Jinschek et al., Mat. Res. Soc. Symp. Proc. 839 (2005) P4.5.1) will overcome the so-called "missing edge, pyramid, or cone" problem of standard electron tomography. While fully eucentric specimen goniometers are required for IBN-TEG and DET-EWR to reach their full potential, tilt protocol/lattice-fringe fingerprinting (W. Qin and P. Fraundorf, Ultramicroscopy 94 (2003) 245) can be practiced with the current generation of goniometers.

Possible Marital Status and Age Differences in Arthritis Impairment, **STEPHEN J. MOREWITZ** (Department of Public Affairs & Administration, Health Care Administration Program, California State University, Hayward, CA, and Research Division, Stephen J. Morewitz, Ph.D., & Associates, Litigation Consultants, CA & IL, 695 Noe St., Ste. 1, San Francisco, CA 94114; E-mail: morewitz@earthlink.net).

Researchers have found that age independently predicts arthritis impairment. However, little is known about the possible association between marital status and arthritis impairment. Marital status may influence the level of social support provided to persons with arthritis, which, in turn, may influence the level of arthritis impairment. Arthritis sufferers who are widowed, divorced, or separated may have lower levels of social support, leading to an increased risk of arthritis impairment compared to arthritis sufferers who are married. The present study evaluates the extent to marital status is related to arthritis impairment, after controlling for possible confounding variables. Methods: The findings from the population-based 1998 National Health Interview Survey (N=30,534 adults) were used. Descriptive and correlational procedures evaluated possible marital status differences in arthritis impairment in persons who report that arthritis impairs their daily activities, after adjusting for age, gender, race, income, and other predictors. Results and Conclusion: The null hypothesis was partly rejected. In the initial analysis, marital status was significantly associated with arthritis impairment (Chi-Square=430.03, df=7, p<.001). Persons who were widowed had the highest prevalence of arthritis impairment (47.1%), compared to persons in other marital status categories, such as persons who were never married (17.4%) and married individuals with the spouse living in the household (29.6%). However, after controlling for age, there was no association between marital status and arthritis impairment. These results indicate that age is a better predictor of arthritis impairment than marital status. These findings highlight the need to screen and treat arthritis impairment in older persons.

Racial and Ethnic Differences among Offenders who Sexually Assault or Rape Their Intimate and Non-Intimate Partners, **STEPHEN J. MOREWITZ** (Research Division, Stephen J. Morewitz, Ph.D., & Associates, Litigation Consultants, CA & IL, 695 Noe St., Ste. 1, San Francisco, CA 94114; E-mail: morewitz@earthlink.net).

Studies have shown that sexual assault or rape is prevalent in intimate and non-intimate relations. However, little is known about the risk factors for predicting sexual assault or rape in these relationships. Ethnic factors may help to predict who will sexually assault or rape their intimate and non-intimate partners. Certain ethnic subcultures may be more likely to promote norms that facilitate sexual assault or rape more than other ethnic subcultures. The present investigation evaluates the degree to which the race and ethnicity of offenders is associated with whether they sexually assault or rape their intimate and non-intimate partners. A random sample of 519 newly filed domestic orders of protection was drawn from newly published domestic court case listings in two cities (Midwest and West regions) between 1997 and 1999. A domestic stalking and violence protocol was constructed to code self-report data obtained from a content analysis of the newly filed domestic orders of protection. Chi-Square and correlational analyses were used to test the null hypothesis that after adjusting for other predictor variables, including the offenders' age and marital status, there are no ethnic and racial differences among offenders who sexually assault or rape their intimate and non-intimate partners. The null hypothesis will be rejected if there are statistical differences at the .05 level of significance. The null hypothesis is rejected based on the statistical results. Hispanic offenders (12.4%) were more likely than White (6.4%) and African-American offenders (5.1%) to sexually assault or rape their intimate and non-intimate partners (Chi-Square=9.64, df=4, p<.05). These statistical differences remained significant after controlling for possible predictor variables.

Complex Regional Pain Syndrome-I of the Lower Extremity in Patients with Diabetes Mellitus, **STEPHEN J. MOREWITZ, GRAHAM P. SHAW, JOEL R. CLARK and TREY MATHENY** (Department of Podiatric Medicine, California School of Podiatric Medicine, Samuel Merritt College, Oakland, CA; Barry University, Miami Shores, FL; Stephen J. Morewitz, Ph.D., & Associates, CA & IL, 695 Noe St., Ste. 1, San Francisco, CA 94114; E-mail: morewitz@earthlink.net).

Little is known about the prevalence and risk factors of Complex Regional Pain Syndrome-I (CRPS-I) (formerly known as Reflex Sympathetic Dystrophy) of the lower extremity in persons with diabetes mellitus (DM). Diabetic peripheral neuropathy and other neuropathic pain disorders may be some of the factors that increase a person's risk of developing CRPS-I of the lower extremity. One study found neurochemical and neuroimaging evidence for regionally selective sympathetic denervation in the painful feet of patients with diabetic neuropathy. The present investigation uses data from the California School of Podiatric Medicine, Computerized Student-Patient Encounter Log System to determine the prevalence and risk factors of CRPS-I of the lower extremity among patients with DM. The Computerized Student-Patient Encounter Log System allows podiatric medical students at geographically disparate training sites to document their participation in the diagnosis, treatment, and management of lower extremity disease. Data on all patients with the primary diagnosis of CRPS-I were extracted from the Computerized Student-Patient Encounter Log System and entered into a Word Excel Spreadsheet. These data were then analyzed descriptively using Version 9.0 of the Statistical Packages for the Social Sciences computer program. The results showed that there were 107 primary diagnoses of CRPS-I made by podiatric medical students. Of the total number of patients with the primary diagnosis of CRPS-I of the lower extremity, 16 or 15% had DM. The mean age of patients with DM who had the primary diagnosis of CRPS-I of the lower extremity was 54.3±13.7 (32-79). Among the DM patients who had the primary diagnosis of CRPS-I of the lower extremity, 5 had DM with peripheral neuropathy, 2 had lower limb tropic ulcers, 2 had pain in their limb, and 2 had hypertension. Patients with DM who had the primary diagnosis of CRPS-I also had other secondary diagnoses: Arthritis, Degenerative Joint Disease (1), Porokoratosis (1), Capsulitis (1), Dementia (1), Epidermal Cyst (1), Dermatitis/ Eczema, and Low Back Pain (1). These findings suggest that persons with DM, especially those with peripheral neuropathy and other diabetes-associated complications, may be at increased risk of developing CRPS-I of the lower extremity.

Advancements Towards the Synthesis of $(Bi_2Te_3)_x(Sb_2Te_3)_y$ Superlattices, **CLAY D. MORTENSEN, RAIMAR ROSTEK, BENJAMIN A. SCHMID, and DAVID C. JOHNSON** (University of Oregon, Department of Chemistry, Eugene, OR).

Superlattices of the Bi_2Te_3 / Sb_2Te_3 family have shown increased thermoelectric efficiency as compared to their bulk alloys through a decrease in the thermal conductivity. A key to their preparation has been the use of low temperature deposition techniques to kinetically trap the desired Bi_2Te_3 / Sb_2Te_3 superlattices. We are exploring the use of modulated elemental reactants to synthesize $(Bi_2Te_3)_x$ / $(Sb_2Te_3)_y$ superlattices by controlling the diffusion distance through modulated layers of the elemental reactants. The modulated elemental reactants are made by depositing thin alternating layers of Bi and Te followed by alternating thin layers of Sb and Te onto ambient substrates to yield a series of superlattice precursors with varying periods. X-ray reflectivity, x-ray diffraction and transmission electron microscopy have been used to characterize the superlattice precursors and their evolution as a function of temperature. For small x and y formation of the desired superlattice competes with interdiffusion of the Bi_2Te_3 and Sb_2Te_3 layers at elevated temperatures. This competition has been explored as a function of annealing temperature and time and will be discussed.

Patterns of Ectomycorrhizal Communities Associated with Quercus garryana *on Serpentine Soils,* **MARIAH MOSER, JAD D'ALLURA and DARLENE SOUTHWORTH** (Departments of Biology and Geology, Southern Oregon University, Ashland, OR 97520; E-mail: indigojive@hotmail.com).

Ectomycorrhizal roots from Oregon white oak (*Quercus garryana*) were compared on serpentine and nonserpentine soils in southwestern Oregon. Ectomycorrhizas were identified by morphotyping based on descriptions of microscopic characters, and by phylotyping based on DNA sequences and restriction fragment patterns. Serpentine soils were characterized by high concentrations of Ni, Cr, and Fe and by a higher Mg:Ca ratio. Species richness and evenness were similar on both soil types. Serpentine soils did not have depauperate mycorrhizal communities. Serpentine and nonserpentine soils differed in the most abundant species present, but sites also varied in the most abundant species. Only one abundant morphotype in the Pezizales occurred on both serpentine sites and not on either nonserpentine site. This indicates a potential serpentine endemic. Pigmented morphotypes were not more abundant on serpentine soils. Overall, variability of the ectomycorrhizal community was as great between sites as it was between serpentine and nonserpentine soils. Serpentine does not appear to select for a distinct set of ectomycorrhizal fungi.

Crater Lake National Park's Terrestrial Environment: Recent Findings, Current Issues and Future Imperatives, **MICHAEL P. MURRAY** (Crater Lake National Park, PO Box 7, Crater Lake, OR 97604; E-mail: michael_murray@nps.gov).

The diverse terrestrial landscape of Crater Lake NP continues to attract researchers to its rich opportunities for studying pristine mountain environments. Significant findings such as fire history of whitebark pine forests, demography of northern spotted owls, gray jay predation, and nutcrackers use of sugar pine will be highlighted. Current issues including exotic plants and disease will also be described. An up-to-

date listing of research opportunities will provide guidance as the Park's second century of terrestrial stewardship begins.

High Electron Mobility Transparent Conductors, **P.F. NEWHOUSE[1], C.-H. PARK[1], D.A. KESZLER[1], J. TATE[2], and P.S. NYHOLM[3]** ([1]Department of Chemistry, Oregon State University, Corvallis, OR 97331-4003; [2]Department of Physics, Oregon State University, Corvallis, OR 97331-6705; [3]Hewlett-Packard Company, 1000 NE Circle Boulevard, Corvallis, OR 97330-4239; E-mail: tate@physics.orst.edu).

Transparent conductors are again of current interest with the discovery of p-type materials to complement already-existing n-type transparent conductors. High electron mobility is a key element to improve conductivity without sacrificing transparency. Thin films of n-type $In_{2-x}W_xO_{3+y}$ ($0 < x < 0.075$) were prepared on fused SiO_2 and yttria-stabilized zirconia (001) single crystal substrates by pulsed laser deposition. Best-case mobilities of 104 and 112 cm^2/Vs were measured at room temperature for polycrystalline and textured films, respectively. Thin film compositional analysis revealed that the W concentration of the highest mobility films was consistently $x \sim 0.03$. A slight widening of the band gap was detected from films with increasing electron carrier density, and the electron effective mass calculated from Burstein-Moss theory was $0.3m_e$. $In_{2-x}W_xO_{3+y}$ films have high visible transmittance of ~ 80%.

Space, Technology, and the Possibility of Dialogue between Engineers and Literary Critics, **J.N. NODELMAN** (Department of English, 3-5 Humanities Centre, University of Alberta, Edmonton, AB, CANADA, T6G 2E5; E-mail: joshua.nodelman@ualberta.ca).

One current long existing within the field of engineering itself urges engineers to study literature and the arts to broaden their minds, thus developing the mental flexibility both to find "out of the box" solutions to technical challenges and, less tangibly, to live more satisfying lives. My position, however, is that the objects and processes engineers design *are themselves artistic*; moreover, based on current approaches to built space emerging from Critical Geography, Architecture, Urban Studies, and elsewhere in the humanities, this paper argues that engineering feats are artistic not only as aesthetically handsome objects but as intellectually invested contributions to ongoing cultural narratives. By recognizing that every work of engineering is a comment on the human condition, as is any novel, play, or poem, we might foster fresh interchange between disciplines regarding our vision of the world as it is and should be.

X-ray Powder Diffraction to Demonstrate Doping of Zinc Oxide with Manganese and Copper, **LORI NOICE[1], JUSTIN HIBBART[1], GIRISH UPRETI[1], BJOERN SEIPEL[1], PETER MOECK[1], AMITA GUPTA[2] and K. VENKAT RAO[2]** ([1]Department of Physics, Portland State University, P.O. Box 751, Portland, OR 97207-0751; [2]Department of Materials Science, Tmfy-MSE, The Royal Institute of Technology, Brinellvagen23, Rm 224, SE 100 44 Stockholm, Sweden; E-mail: lknoice@hotmail.com and pmoeck@pdx.edu).

In the pursuit of new technologies prospectively enabled by dilute magnetic semiconductors with Curie temperatures well above room temperature (P. Sharma et al. *Nature Materials* **2** (2003) 673), our international collaboration is producing spintronics materials that need to be analyzed for both their magnetic properties and their crystallographic phase content. In this Portland State University based sub-project, precursor powders of zinc oxide containing a few percent of copper oxide and occasionally manganese oxide were analyzed, after a thermal treatment, by means of X-ray powder diffraction to identify the crystallographic phases present and to search for systematic trends in the zinc oxide lattice constants with the copper oxide and manganese contents in the powder. Selected zinc oxide X-ray peaks from all samples were fitted to Gaussian curves, the lattice constants were calculated and plotted versus the nominal powder composition. Unlike the ZnO + 4% CuO and ZnO + 2% Mn + 2% CuO samples, the ZnO + 2 % CuO sample showed only a negligible shift in the lattice constants. For each sample, the relative intensities of copper oxide peaks to zinc oxide peaks were calculated and plotted versus the nominal powder composition. Both the ZnO + 4% CuO and ZnO + 2% Mn + 2% CuO samples took up more copper into the zinc oxide lattice than the ZnO + 2% CuO sample. CuO was the only copper oxide phase present. The lack of a manganese (oxide) phase suggests the uptake of up to 2 % of this transition metal into the zinc oxide lattice.

Serpentinite Soil Ecology on Cyprus: A Reappraisal of a Foundation of the Soil Erosion Paradigm, **JAY S. NOLLER** (Department of Crop and Soil Science, Oregon State University, 3017 ALS, Corvallis, OR 97331; E-mail: jay.noller@oregonstate.edu).

Sparse soil and tree cover on the serpentinized bedrock of the Troodos Mountains of Cyprus have long been blamed on improper land management, overgrazing and unlimited tree harvesting. The idea that such practices would lead to loss and degradation of soil was incubated on the eastern Mediterranean island of Cyprus in the late 19th century. The treeless, mass-wasted slopes of the central serpentinite diapir, Mount Olympos, were an effective demonstration of what the new colonial government held as the effect of reckless land wasting. Given Eratosthenes' 2,000-year-old description of an ancient landscape in which''thick' forests of Cyprus had existed where they saw none, foresters convinced the British colonial government to ameliorate deforestation and soil degradation. New laws and governmental policies, here and elsewhere in European colonies, set in motion cadres of

foresters and soil conservationists to combat soil erosion. These efforts would be held as evidence in support of the newly formalized soil-erosion paradigm, which decades later found strong proponents in the USA. This study is the first to postulate that the special character of serpentinite soil ecology is responsible for the''degraded' appearance of not so insignificant parts of the island landscape.

Geochemical and Microbiological Processes in Acid Mine Waters from Iron Mountain, CA to Rio Tinto, Spain, **D. KIRK NORDSTROM** (U.S. Geological Survey, 3215 Marine St., Boulder, CO 80303; E-mail: dkn@usgs.gov).

Results of investigations into the geochemistry and microbiology of acid mine waters have not only offered insight into the complex processes that produce them but have gradually influenced remedial decisions on mine cleanup. Field studies of efflorescent salts at Iron Mountain, CA, showed they form from waters with negative pH values. Mine plugging can dissolve these acid salts to create pools of acid with high metal concentrations that have deleterious consequences not anticipated by remediation. Hence, mine plugging is not a recommended procedure. Geochemical aqueous-speciation modeling of field data identified processes that govern the solubilities of major solutes such as iron, aluminum, and calcium and constraints on some trace element mobilities (copper, zinc, manganese, and lead). Tracer studies with mass-loading calculations are essential to quantify amounts and locations of source inflows. Geochemical mass-transfer models provide simulations of pyrite oxidation that are confirmed remarkably well by field data. Field measurements of iron oxidation rates have shown that, given optimal conditions, oxidation rates tend toward maximum values similar to historical rates in batch enrichment cultures, about 5×10^{-7} mol L^{-1} s^{-1}. Recent research from Rio Tinto indicates temperature-dependent iron oxidation rates and slightly slower rates of iron(III) hydrolysis and precipitation. Although *Acidithiobacillus ferrooxidans* is commonly present where sulfides are oxidizing, *Leptospirillum ferrooxidans* and *Acidithiobacillus thiooxidans* might be as important. At higher temperatures and more extreme conditions, such as those at Iron Mountain, iron-oxidizing Archaea have been found. Microbial iron-oxidizing communities and their functions are the subject of much current research.

Coupling Porphyrin Photosensitizers to Metal Nanoparticles through Oligonucleotide Linkers, **AOIFE M. O'BRIEN, DENEIL BRAGG, BAHAREH HABIBI, SAYMORE MUTSAMWIRA, HIEU PHUNG, SARITA SITAULA, JOSH WILLIAMS, and SCOTT M. REED** (Portland State University, Department of Chemistry, PO Box 751, Portland, OR 97207; E-mail: aobrien@pdx.edu or sreed@pdx.edu).

Photodynamic therapy (PDT) is a treatment that uses porphyrin photosensitizers in conjunction with light to destroy cancerous cells *via* cytotoxic singlet oxygen. We are developing switchable photosensitizers by coupling porphyrin photosensitizers to gold nanoparticles resulting in their deactivation. Oligonucleotide hybridization events can then provide a means of reactivating the photosensitizer if the nanoparticle and photosensitizer are attached at either end of an appropriate oligonucleotide strand. This switching approach can be used to increase the specificity of treatment and reduce the side effects caused by damage to healthy tissue.

The development of such switchable PDT agents has involved nanoparticle preparation, porphyrin synthesis and bioconjugation. Gold nanoparticles have been synthesized using the biocompatible ligand lecithin (a soy extract). Lecithin is a naturally occurring phospholipid, which we anticipate will render these gold nanoparticles safe for *in-vivo* applications. The synthesis of long wavelength (> 600 nm) porphyrins, for attachment to oligonucleotide strands will be reported. The phosphoramidite derivative of the known PDT agent 5,10,15,20-Tetrakis(4-hydroxyphenyl)-21H,23H-porphine has been synthesized and attached to a 29-mer oligonucleotide strand. The 29-mer sequence is designed to target the erbB-2 (Her2/*neu*) gene which is overexpressed in 25 – 30 % of primary breast cancers.

Serpentine and Nonserpentine Accessions of Achillea millefolium *Differ in Their Tolerance of Serpentine Substrates and Response to Amendment,* **RYAN E. O'DELL and VICTOR P. CLAASSEN** (Department of Land, Air, and Water Resources, University of California Davis, Davis, CA 95616; E-mail: reodell@ucdavis.edu).

Barren serpentine substrates are difficult to revegetate due to multiple growth limitations, including low N, P, and K, low Ca:Mg molar ratios, high levels of heavy metals, low OM, low CEC, and poor WHC. Accessions of *Achillea millefolium* collected from granite and serpentine substrates were grown on serpentine topsoil, barren serpentine substrate, and barren serpentine substrate amended with a mixture of yard waste compost, slow-release NPK fertilizer, and $CaSO_4 \cdot 2H_2O$ (gypsum). Tolerance, survival, biomass production, and plant nutrient content were measured for each. The goals of this study were to: 1) identify the substrate amendment combination that maximized establishment and growth of *Achillea*, 2) compare seedling establishment, survival, and growth for the serpentine and granite accessions of *Achillea* to determine if a serpentine edaphic ecotype of *Achillea* exists, and 3) if a serpentine edaphic ecotype of *Achillea* exists, what physiological features convey a higher tolerance of serpentine for this ecotype than a nonserpentine ecotype. Seedling establishment, survival, and growth were greatest for *Achillea* on barren serpentine substrate amended with 30% (v/v) compost and 220 mg kg^{-1} each of N, P, and K. The serpentine *Achillea* accession displayed a greater tolerance of the barren serpentine, serpentine topsoil, and the

amended barren serpentine substrate than the granite accession. The greater capacity of the serpentine *Achillea* accession for selective Ca translocation from roots to the shoot resulted in a significantly higher shoot Ca:Mg molar ratio than the granite accession and appeared to be the most important physiological feature conveying greater tolerance of the serpentine accession for serpentine substrates.

A New Web-Based Outreach Tool for Soil Survey Inquiries, **A.T. O'GEEN and D.E. BEAUDETTE** (Land, Air and Water Resources, University of California, Davis, One Shields Avenue, Davis, CA 95616; E-mail: atogeen@ucdavis.edu).

High costs and complexity of commercial GIS software can limit the average person's ability to access digital soil survey information. Although published hardcopies of soil surveys exist for most of the State, many are out of print and not easily accessible to the public. We developed a web-based soil survey browser to enhance the accessibility of soils information for the public. Open source software tools such as Mapserver, GDAL, MySQL, Apache, and PHP were used to create a seamless interactive soils map of California using the State Soil Geographic Database (STATSGO, 1:250,000 scale) and Soil Survey Geographic Database (SSURGO 1:24,000 scale). Publicly available contextual geographic data such as 7.5 minute quadrangle borders, aerial photography, LANDSAT, urban areas, highways, and hydrography were incorporated so that users can easily locate their position on the map. A dynamic legend and context map were designed to aid users in map interpretation. Soil map units can be queried with a mouse click, taking the user to a hierarchal summary of map units and soil components. At the map unit level, selected attribute data are summarized in tabular format. At the component level, selected attribute data is presented in tables and figures along with a diagram of a representative soil profile. Many concepts such as soil series, taxonomic information, or terminology specific to soil survey interpretations are linked to NRCS pages that contain detailed descriptions of terms. The integrated linkage to outside information makes the online soil survey a useful tool for general soils education as well

Phylogenetic Comparisons of Bacterial Communities from Serpentine and Non-Serpentine Soils, **DAVID K. OLINE** (Department of Biology, Southern Oregon University, 1250 Siskiyou Blvd., Ashland, OR 97520; E-mail: olined@sou.edu).

I have conducted an extensive culture-independent survey of bacterial communities in serpentine and non-serpentine subalpine forest soils in the Klamath and Siskiyou Mountains in Northern California and Southern Oregon in order to identify differences in community structure unique to serpentine soils. Unlike most molecular microbiological studies, I have performed true replication of paired soil samples across a large spatial scale. At each of three sites, paired soil samples straddled distinct boundaries between serpentine and immediately adjacent non-serpentine soils, and from each sample a bacterial 16S rRNA clone library was constructed and 50 random clones sequenced. I performed a range of new phylogenetically based statistical tests using the sequence information. At the largest phylogenetic scale, community differences were small and not significant for any comparison. Tests at the finer phylogenetic scale were almost always significant with several notable exceptions: 1) in pairwise tests comparing two serpentine samples, two out of three tests were not significant, showing that there is significant community similarity within a soil type across larger spatial scales; 2) in pairwise tests comparing site vs. site, one of three tests was not significant, showing that local site characteristics can structure communities even across the serpentine/non-serpentine boundary. No major group of Bacteria differed significantly in abundance between soil types, but numerous finer scale clades are unique to a soil type, sampling site, and individual samples. These results highlight the need to investigate enormously diverse soil communities using more phylogenetically specific 16S primers than the Domain level primers commonly used.

Structural studies of the HIV-1 CA N-terminal Domain, **ROB OSLUND, RYAN VANWOERKOM, RYAN DELUCA, CHAD SANADA, CRAIG HUNTER, and BRUCE HOWARD** (Dept. of Physical Science, Southern Utah University, 351 W. Center St. SC309, Cedar City, UT 84720; E-mail: howard@suu.edu).

The capsid (CA) protein plays an essential role in the replication of the human immunodeficiency virus (HIV-1). This protein forms a conical core, which surrounds the viral RNA genome along with its associated integration, and replication machinery. Upon entering a host cell, the capsid protein must disassemble in order to release the viral RNA genome and enzymes for reverse transcription and integration. Proper assembly and disassembly is required for viral infectivity. In many variants of HIV-1, the human protein cyclophilin A may be involved in this process, as it forms a tight complex with the N-terminal domain of CA (NTD). In an effort to understand the molecular details of the interactions between CA monomers, and the effect of cyclophilin A-binding, the structure of NTD has been solved in the absence of cyclophilin A to analyze the binding-induced structural changes. We find the main helical bundle of the domain to undergo only very slight changes upon cyclophilin A binding, with all significant changes localized to the immediate vicinity of the exposed surface loop to which cyclophilin A binds. Additional crystal forms of the isolated NTD are also being pursued to study the protein contacts involved upon CA assembly in the mature core of the virus.

*Ingestion, Accumulation, and Physiological Effects of Nickel in Deer Mice (*Peromyscus maniculatus*) and Wood Rats (*Neotoma fuscipes*) from Serpentine and Non-Serpentine Areas of Southern Oregon*, **CHRISTINE OSWALD[1] and MATTHEW TODD[2]** ([1]Department of Biology, Southern Oregon University, Ashland, OR 97520; [2]Department of Science, Grants Pass High School, Grants Pass, OR 97526; E-mail: oswald@sou.edu).

In laboratory studies on the effects of nickel exposure in mammals, nickel accumulates in and has deleterious effects on several organs. We investigated the potential effects of nickel exposure on small mammals of serpentine areas in southern Oregon by 1) measuring nickel concentration of gastrointestinal contents, 2) measuring nickel concentration in several body organs, and 3) performing diagnostic blood tests for possible physiological impairment. Stomach and intestinal contents of deer mice (*Peromyscus maniculatus*) from serpentine areas had significantly higher nickel levels (median = 17.2 and 13.1 mg/kg dry, respectively) than deer mice from non-serpentine areas (0.3 and 1.4, respectively). Dusky-footed wood rats (*Neotoma fuscipes*) from serpentine areas also had higher nickel in stomach and intestinal contents (12.7 and 5.0) than their non-serpentine counterparts (0 and 0). Nickel concentration was significantly greater in reproductive organs of both male and female deer mice (2.4 to 5.8) than in non-serpentine mice (0 to 0.1), but not in other internal organs. Deer mice from serpentine areas and non-serpentine areas did not differ in levels of the following: erythrocyte counts, leukocyte counts, plasma albumin, plasma urea, plasma alanine aminotransferase. However, plasma alkaline phosphatase was significantly higher (233 ± 38 IU/L) in deer mice from serpentine areas than in those from non-serpentine areas (97 ± 6). These results suggest possible liver impairment, but no impact on erythropoiesis, gross immune function, general nutritional status, or kidney function in deer mice of serpentine areas.

From Rock to Blood: Evaluating The Geochemistry and Fate of Serpentine Soil Trace Metals, **CHRISTOPHER OZE** (Department of Earth Sciences, Dartmouth College, 6105 Fairchild Hall, Hanover, NH 03755; E-mail: oze@dartmouth.edu).

Serpentine soils contain elevated concentrations of biologically toxic trace metals (i.e. Cr, Ni, Mn, V, and Co) in which the release of these metals into the environment is directly related to the mineralogy and the weathering of the bedrock and soil. The geochemistry of serpentine soil trace metals will be discussed in order to examine the release and cycling of these elements in the environment. Chemical extractions performed on serpentine soils provide a quantitative assessment of where trace metals may be bound in the soil (such as surface complexes, (oxy)hydroxides, silicates, and/or oxides); however, redox transformations through inorganic and/or biotic processes must also be considered when evaluating the mobility, the availability, and the toxicity of these elements. For example, chromium in serpentinites and serpentine soils is dominantly in the innocuous trivalent form; however, geochemical interactions during rock weathering and pedogenesis may lead to hexavalent chromium generation, the toxic and carcinogenic form of chromium. Additionally, serpentine soil vegetation (such as manzanita, grasses, and plantago) contains elevated trace metal concentrations. By examining plant uptake processes and elemental selectivity, we are able to evaluate how these metals are being redistributed back into the soils and throughout the environment. Finally, the relationship between human health and serpentine soil exposure is a subject of growing concern. The bioavailability and uptake pathways of serpentine soil metals and related aerosols and waters in regions with high human population densities and high serpentine soil occurrence are currently being investigated in areas of California.

Bacterial Ecotypes Associated with Waste Rock at a Site of Acid Mine Drainage, **KATHLEEN A. PAGE[1] and ALAN B. OPPENHEIMER[2]** ([1]Southern Oregon University, Department of Biology, 1250 Siskiyou Blvd., Ashland, OR 97520 and [2]Open Door Networks, Inc., 110 South Laurel, Ashland, Oregon, 97520; E-mail: page@sou.edu and alan@opendoor.com).

16S rRNA gene clone library analysis of crushed waste rock at a site of acid mine drainage (AMD) revealed three dominant eubacterial ecotypes; *Acidithiobacillus ferrooxidans* and *Acidithiobacillus thiooxidans* made up 56% of the library, *Leptospirillum ferrooxidans* made up 12% of the library, and a novel ecotype related to *Bacillus psychrodurans* made up 14% of the library. *A. ferrooxidans, L. ferrooxidans* and three different heterotrophic isolates related to *B. psychrodurans* were recovered from the mining site and characterized.

Several reports have described bacterial species present in AMD water and in slimes and snotites adhering to surfaces within mine workings but reports of bacterial communities associated with exposed waste rock tailings are lacking. Chemoautotrophic *A. ferrooxidans, A. thiooxidans* and *L. ferrooxidans* at sites where AMD is generated has been frequently reported. The presence and activities of *Bacillus* and other heterotrophs in AMD communities is an active area of investigation. DNA and bacteria were isolated from exposed tailings at the Blue Ledge copper mine, an abandoned mine in the Siskiyou mountain range in Northern California. Snow and rainfall percolates through mine shafts and through tailings, creating a metal laden acid drain (pH 3.5) that contaminates nearby Joe Creek. Isolation and identification of bacterial species involved in AMD will lead to a greater understanding of the mechanism of AMD and may yield

insight as to the best methods for prevention and remediation of ecological damage associated with mining sites.

The Instream Benefits of the WISE Project, **STEVE PARRETT** (Project Manager, Oregon Water Trust, 522 SW 5th Avenue, Suite 825, Portland, OR 97204; E-mail: steve@owt.org).

While Oregon is known nationally as persistently cloudy and wet, the summer months are actually very warm, pleasant and dry. The out-of-stream demand for the summer water in local streams and rivers generally exceeds the available supply in much of the state. As a consequence, many streams suffer from low summer flows and the little water remaining instream is often of very poor quality. This situation limits the productivity of important salmonid spawning and rearing habitat and creates health risks for people wishing to enjoy their local streams like Bear and Little Butte Creeks in Jackson County.

The WISE project offers an opportunity to provide substantial instream benefits while simultaneously improving the irrigation water reliability and wastewater disposal issues facing the community. WISE may reduce poor quality return flows from agricultural lands; reduce the number of water diversion barriers and increase the volume and velocity in Bear and Little Butte Creeks as well as a number of their tributaries.

The increased quality, quantity, and velocity of water in these streams will increase the area of available stream habitat for fish and other wildlife while improving the quality of the existing habitat. The number and vitality of fish should increase as a result which will provide many benefits to the ecosystem and economy of the Rogue Basin. People may no longer need to fear for their health when wading into their local stream on a hot, sunny day since the water temperature and bacteria levels will be lower, dissolved oxygen higher and the water color improved from orange-brown to green-blue.

Dementia Is Not A Disease: What Is It? **FRED C.C. PENG** (Department of Neurosurgery and Neurological Institute, Taipei Veterans General Hospital, Taipei, Taiwan; E-mail: ccpeng@vghtpe.gov.tw; fccp@cronos.ocn.ne.jp; pengf001@hawaii.rr.com).

In 2003, I published an article, "Is Dementia A Disease?", in which I concluded that it is not a disease. I shall take this conclusion as my point of departure in order to develop further what I think dementia is, because dementia is a common realm of investigation between neurology and neuropsychiatry, within which it is often equated with Alzheimer's disease when in fact dementia may be triggered by one of a number of neurodegenerative diseases, such as Pick's disease, Alzheimer's disease (AD), Parkinson's disease (PD), Fischer's disease (FD), and the like.

My purpose is to show that dementia is a consequence of such a disease and not a disease in itself and that it cannot be synonymous with AD which is erroneously claimed to have two hallmarks, neurofibrillary tangles and senile plaques. I shall conclude that dementia is a form of language disorders resulting from the decline of the brain functions of memory and cognition due to progressive apoptosis, which must be differentiated from aphasia. Such brain functions, when disordered, can take the top-down or the bottom-up course of deterioration, depending on the disease, cortical or subcortcal, respectively, on the ground that each such disease spreads from one region to another.

Prescribed Fire at Crater Lake: Burning, Beetles, and Beyond, **DAN PERRAKIS** (College of Forest Resources, University of Washington, Box 352100, Seattle, WA 98195; E-mail perrakis@u.washington.edu).

Ponderosa pine-dominated forests in the southern and eastern regions of Crater Lake National Park are currently undergoing fire restoration efforts to restore declining forest health, which has been attributed to historic fire exclusion, selective logging, and grazing. Prescribed burning thus far appears effective at reducing fuel loads and restoring historic forest structure. However, post-burn mortality has often occurred among the large pines – supposedly fire-resistant trees, and the primary targets of protection and restoration efforts. Mortality has been primarily attributed to attacks by bark beetles, especially the western pine beetle (*Dendroctonus brevicomis*). Beetle-related mortality appeared higher following more intense burns, and following spring burns, as compared with fall burns of equal intensity. Oleoresin flow, believed to be the primary mechanism of tree defense against beetle attacks, showed no evidence of decline following burns, although long-term effects of fire on resin defenses are not known. Current research efforts are focused on understanding the growth processes that affect resin production in ponderosa pines, and how these might be affected by fire.

Characterization of Isostearic Acid as a Pasting Liquid for the Carbon Paste Electrode, **STEVEN C. PETROVIC** (Department of Chemistry, Southern Oregon University, 1250 Siskiyou Blvd., Ashland, OR 97520; E-mail: petrovis@sou.edu).

Preliminary results are reported on the replacement of mineral oil with isostearic acid as a carbon paste electrode (CPE) pasting liquid. Isostearic acid, like mineral oil, exists at room temperature as a viscous, hydrophobic liquid. However, as a branched structural isomer of stearic acid, isostearic acid possesses carboxylic acid functional groups that modify the CPE with increased selectivity toward cations. The voltammetric response for copper ions at the CPE and modified CPE (MCPE) were compared using square-wave anodic stripping voltammetry (SWASV). Preconcentration of Cu^{2+} for 30 s under mildly acidic conditions provided a four-

fold increase in the SWASV response at the MCPE compared to the CPE. The detection limit for Cu^{2+} under these conditions improved from 0.2 to 0.06 ppm. The detrimental effect of hydrogen reduction on the SWASV signal for Cu^{2+} was apparent at smaller deposition potentials applied to the MCPE during the ASV preconcentration step, presumably due to the enhanced ion-exchange capability at the electrode surface of the MCPE.

The Wetland Ecology Trial Mapping and Assessment Project (WETMAP): A Preliminary Analysis of Relationships Between Leaking Canals and Artificial Wetlands, **MARTINIAN R. PRINCE** (216 N. 14th St., Philomath, OR 97370 and Environmental Studies Program, Southern Oregon University, 1250 Siskiyou Boulevard, Ashland, OR 97520; E-mail: riparian@mind.net).

Leakage from a 90 year-old canal system in Southern Oregon's Rogue Valley has formed numerous artificial wetlands. The canal is the primary groundwater source for the wetlands during the arid summer irrigation season, thus artificially extending their water regime by several months. The 200-mile-plus canal system has been proposed for conversion to a closed pipeline. The Wetland Ecology Trial Mapping and Assessment Project (WETMAP) tested a method to 1) identify canal-associated wetlands (CAW), 2) determine the general ecological and sociological value they have and 3) project likely impacts following a canal-to-pipe conversion. Using a Geographical Information System and field visits, primary and secondary data indicated several key factors that will influence wetland response to piping. The effects of reduced groundwater levels (drawdown) are influenced most by distance, drainage, soil characteristics and adjacent water sources. Drawdown will alter more than 70% of CAW; with those farthest from the canal, on irrigated land, and in natural drainages least at risk for water loss. Negative impacts will include alteration of hydrologic functions, reduction in wetland size and loss of hydrophytic vegetation. Successional replacement by more xeric species, many of which are invasive and exotic, will occur in many cases, particularly in shrub-scrub and emergent wetlands. These alterations will likely cause some wildlife species to change their dispersion and utilization patterns. Assuming that a canal-to-pipeline conversion eliminates all leakage, approximately half of all canal-associated wetlands in the study area (roughly 60 wetland acres) will be impacted to such a degree that they will cease to function as wetlands.

Evaporation and the Crater Lake Water Budget, **KELLY REDMOND** (Western Regional Climate Center, Desert Research Institute, 2215 Raggio Parkway, Reno, NV 89512; E-mail: Kelly.Redmond@dri.edu).

With its relatively simple geometry, climatic circumstances, and the availability of a variety of long-term data, properties of the hydrologic budget of Crater Lake may be inferred more readily than many other lakes. The lake occupies 78.5 percent of its own drainage basin, and effectively acts as a huge natural leaky precipitation gage. This study has extended previous examinations of the lake budget by making use of buoy data. The lake gains water through precipitation and delayed runoff and loses water through seepage and evaporation. Seepage can be estimated from rare freezing events with no precipitation, and is 127 cm/yr. Evaporation had been previously estimated as a residual, but is here estimated more directly from measurements from the buoy, and totals 76 cm/yr. This is balanced by precipitation, most of which falls as snow. Sources of uncertainty in these components are discussed. The buoy data corroborate previous findings using other methodologies that evaporation is greatest on the coldest days. Seasonally, evaporation is at a maximum in autumn and a minimum in spring. Proxy records are used to extend the effective length of the evaporation record to nearly a half-century. Precipitation variance is about five times the evaporation variance at annual scales. Annual lake level change is highly correlated with precipitation at Park Headquarters (r=0.96), with each cm of precipitation there above the equilibrium value (168.6 cm) corresponding to a rise of 1.4 cm of the lake. Sources of this particular ratio are discussed.

Brassicaceae Seed Meal as a Soil Amendment to Improve Plant-Available Nitrogen and Yields in Organic Farming Systems, **ALINA RICE, JODI JOHNSON-MAYNARD, and MATTHEW MORRA** (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Moscow, ID 83844-2339; jmaynard@uidaho.edu).

Soil amendments used in organic farming may limit N availability and be cost prohibitive. Our objective was to determine if Brassicaceae seed meal, a byproduct of oil extraction that contains allelochemical-producing compounds called glucosinolates, can increase plant-available N and yields of lettuce (*Lactuca sativa*) and beet (*Beta vulgaris*). Three seed meals with varying glucosinolate concentrations and profiles, *Brassica juncea* (BJ), *Brassica napus* (BN), and *Sinapis alba* (SA), were added to field soils at two different rates (3 and 10 Mg ha^{-1}) in each of two years. Crop yields and N uptake varied with precipitation, meal type, and amendment rate; however, the highest rate of BJ meal most often produced the largest increases in biomass and N uptake, except for lettuce in year 2. The largest concentrations of extractable NH_4^+-N (170 mg kg^{-1} soil) and NO_3^--N (130 mg kg^{-1} soil) were also measured in year 2 plots amended with the highest rate of BJ meal. Greater moisture in year 2 increased the release of allelochemicals from BJ meal, which inhibited germination of the small-seeded lettuce crop and stimulated N mineralization of soil organic N. Laboratory incubations conducted with the same soils and meals indicated that 52 to

112% of the N added in the meals was mineralized in 21 d and that nitrification was inhibited by both BJ and SA meals. Brassicaceae meals have the potential to improve crop yields by increasing plant available N, but overall effects on crop growth must include consideration of water inputs, potential inhibition of seed germination, and glucosinolate type and concentration.

Advances in Nanoscale Sample Handling and Manipulation, **JOSEPH C. ROBINSON** (President, Ascend Instruments, 15275 SW Koll Parkway, Beaverton, OR 97006; Email: joe@ascendinstruments.com).

Electron microscopic examinations of materials and devices at sub micron dimensions have become essential to understanding materials properties at the molecular and atomic scale. Electron microscopes (SEM and TEM) and focused ion beam (FIB) systems have become the new laboratory environment for both academic and industrial research. Once the exclusive tool of semiconductor facilities, the combination SEM & FIB, in particular, facilitates site specific sub-surface sampling for "nano-stratagraphic" measurements and subsequent thinning for later viewing and crystallographic study in the TEM. Due to the constrictions of operating remotely inside the vacuum chamber of these microscopes, many new technologies have been developed for touching, testing, extracting, and otherwise analyzing samples *in situ*. The development of piezoelectric motors has had a revolutionary effect on the nature of these enabling technologies and replaced many of the traditional methods. This paper will present an overview of this tiny revolution in material research oriented "nanosurgery" and provide a glimpse into the future of nano-assembly and automation of the factories of the future.

Geochemistry and Isotopic Composition of H_2S-Rich Water in Flooded Underground Mine Workings, Butte, Montana, **AMBER ROESLER and CHRIS GAMMONS** (Department of Chemistry and Geochemistry, Montana Tech of the University of Montana, 1300 W Park St., Butte, MT 59701; E-mail: aroes7@yahoo.com).

Groundwater being pumped from the flooded West Camp underground mine workings of Butte, Montana, is elevated in hydrogen sulfide (H_2S), has a circum-neutral pH, and has high arsenic but otherwise low metal concentrations. The daily flux of H_2S and As pumped from the extraction well are each estimated at roughly 0.1 kg. Isotopic analysis of coexisting aqueous sulfide and sulfate confirms that the H_2S was produced by sulfate-reducing bacteria (SRB). The H_2S-rich mine water is not confined to the immediate vicinity of the extraction well, but is also present in flooded mine shafts up to 1 km away. This implies that SRB are well-established throughout a large portion of the flooded West Camp mine complex. The West Camp mine waters are close to equilibrium saturation with amorphous FeS, amorphous ZnS, siderite, rhodochrosite, barite, and calcite, but are undersaturated with orpiment (As_2S_3). The higher solubility of orpiment relative to other metal sulfides allows concentrations of dissolved arsenic (~ 100 mg/L) that are well above human health standards. The West Camp waters differ markedly from the acidic, heavy metal-rich mine waters of the nearby acidic Berkeley pit-lake as well as the flooded underground mine-workings associated with it. These differences can be attributed to geology, mining history and microbiology.

Butterflies in the Blender: Patterns of Richness and Diversity in the Cascade-Siskiyou National Monument, **ERIK B. RUNQUIST** (Section of Evolution and Ecology, One Shields Avenue, University of California, Davis, Davis, CA 95616; E-mail: ebrunquist@ucdavis.edu).

Besides plants, few studies have focused on species composition in ecological transition zones, especially when the species in question are mobile. The Cascade-Siskiyou National Monument (CSNM) has gained attention as an important and complex ecological transition zone, and is characterized by assemblages of species from dissimilar environments. Butterfly diversity in the region has been intensively and extensively surveyed since before CSNM designation, and a regionally outstanding species assemblage has been documented with at least 114 confirmed species. Species composition displays strong influences from adjacent regions, including the Cascades, the Great Basin, and (especially) the California Floristic Province. Transects sampled routinely throughout 2003 and 2004 and less intensive surveys dating back to the early 1990's indicate complex patterns of butterfly diversity that are strongly influenced by life history characteristics and site-specific factors like plant species richness, habitat structure, and moisture availability. These studies are compared and contrasted previous butterfly community studies in northern California and southern Oregon.

Scientific Influences on Frank Gehry's Disney Hall, **KARIN SABO** (California State University Northridge, Northridge, CA 91330; E-mail: kksabo@sbcglobal.net).

Leading edge scientific theories often lead artists to incorporate science into their artwork. Renowned architect Frank Gehry has designed many signature buildings from residential houses, where the process of building is incorporated into the final structure, to the new Disney Hall in Los Angeles, which opened in October of 2003.

Made of steel, the enormous Disney Concert Hall was designed with waveform principles in mind. The idea was to make the building evoke a ship at sea, so the building looks like waves frozen in motion. The inside auditorium continues the wave patterns using curved shapes to create dynamic, state-of-the-art acoustics, with the stage at the center such that the

audience surrounds the orchestra. Yet despite the abstract wave designs, many elements of the building appear to be of organic influence, often looking like huge sheet metal flowers, opening and unfolding outward according to a symmetric design that replicates the patterns of the universe itself.

Gehry's building is a redefinition of area and space and a fantasy of shape and design, a perfect illustration of the cross-pollination of science and art. Architect-theorist Charles Jencks says that "it is time that aesthetics and the cosmic drive to learning were placed back at the centre of culture, where they belong." Disney Hall, situated right in downtown Los Angeles, is one large step toward placing science and art back at the center of culture.

Crater Lake, Oregon: Lake Ecology and Research Developed into a K-12 Inquiry Curriculum Using the Internet, **JOHN SALINAS[1], KATHLEEN SALINAS[1], LAURA MISARAS[2], and MARSHA McCABE[3]** ([1]Rogue Community College, 3345 Redwood Highway, Grants Pass, OR 97527; [2]Soaring Enterprises, Eugene, OR; [3]National Park Service, P.O. Box 7, Crater Lake, OR 97604; E-mail: jsalinas@roguecc.edu).

Crater Lake in southern Oregon, offers unique problems involving access to limnological information and activities for educators. New support and funding have allowed National Park Service staff to work with local educators and research scientists to develop and deliver curriculum focusing on Crater Lake and its scientific research program. Lessons are currently available to introduce students to (1) Crater Lake's geologic setting and basin, (2) High Cascade's weather patterns, (3) attributes of the physical and chemical lake, (4) the lake as an ecosystem, and (5) physical research problems and questions. The authors have designed lessons for use with Oregon benchmark year students in the fifth, eighth, and tenth grades. Each lesson includes background material for the teacher, worksheets for the students, and activities for scientific inquiry. An important aspect of this curriculum design is providing access. Most teachers do not have the option to visit the lake with their students because Crater Lake is under snow for much of the year. For this reason the internet is used to deliver the lessons, limnological data, and audiovisual materials.

Ocean Science for Adult and English as a Second Language Learners, Lessons Developed as a Participant in the Ocean and Math Collaborative Project, **KATHLEEN SALINAS** (Rogue Community College, Grants Pass, OR 97527; ksalinas@roguecc.edu).

Bringing ocean science into the adult basic education classes is the goal of the Math and Science Collaborative Project. This project has nearly completed its first year with sixteen community college instructors participating along with many OSU instructors and ocean science professionals. The information brought to the adult basic education students at the Rogue Community College in Grants Pass is the focus of my presentation.

Adult Learners at Rogue Community College have been educated in ocean science using a curriculum was developed and presented in the classroom. The curriculum included many new hands on activities that were tried successfully in the classroom. A part of this curriculum focused on the human impact on the oceans and on Earth. Developed were several presentations, virtual tours, that took students on a journey to the deep ocean. During one tour, students realized the difficulty of diving to deep ocean depths and together they came up with solutions that made the dive possible. Students explored the ocean depths with ocean scientists and made pioneer discoveries. During a second tour, students discovered new and fascinating behaviors of the spinner dolphin. Students worked together to create a kinesthetic model of this behavior.

Adult learners are presented with current information about our Earth's largest resource in a way that enhances their own educational goals. Showing these students a glimpse of this vase natural world that influences their life in so many ways can leave a positive impression and may influence their consumer choices in the future.

Species of Special Concern in Crater Lake National Park: Initial Findings and Implications for Long-term Monitoring, **DANIEL A. SARR, ANDREW DUFF, and SEAN B. SMITH** (Klamath Network-National Park Service, 1250 Siskiyou Blvd., Ashland, OR 97520-5011; E-mail: Dan_Sarr@nps.gov).

From 2002-2004, the *Klamath Network Inventory and Monitoring Program* conducted inventories for rare plants, non-native plants, bats, reptiles, and amphibians at Crater Lake National Park. These inventories have yielded several new species records and populations for the park. Among the new plant findings include a record and range extension of a rare nonvascular plant, *Schistostega* pennata, and a heretofore unrecorded population of the rare sundew hybrid *Drosera x obovata*. Preliminary data suggest that bat abundances are limited by cool night temperatures during cold weather periods in the park. We also observed that an overwhelming majority of high elevation bat captures (93.9%) were male, a pattern observed in a previous inventory at Lassen Volcanic National Park. These findings and subsequent analyses of inventory data are increasing our understanding of the factors influencing the distribution and abundance of species in the park. The Inventory and Monitoring Program is also working to place the biodiversity of Crater Lake NP in a regional context through analyses of species distributions in other network parks and across the larger Klamath Region landscape. With this baseline information, Network and Park Scientists are developing the foundation for a long-term monitoring program of park species and ecosystems.

Incorporating Classification Trees into a Pedogenic Understanding Raster Classification Methodology, Green River Basin, Wyoming, **AMY M. SAUNDERS and JANIS L. BOETTINGER** (Plants, Soils, and Biometeorology Department, Utah State University, 4820 Old Main Hill, Logan, UT 84322-4820, E-mail: asaunders@cc.usu.edu).

We demonstrate that the pedogenic understanding raster classification (PURC) approach can be transferred to a new soil survey project area and that classification tree analysis is a viable alternative to a knowledge-based decision tree for predicting the distribution of soil classes. The new area is in the Green River Basin of Wyoming, which has greater variability in parent material, lower erosion rates, and a colder climate than the Powder River Basin of Johnson County, Wyoming, where the PURC approach was developed. Topographic data derived from Digital Elevation Models (DEMs) and various band combinations and ratios of Landsat 7 remotely sensed spectral data were selected to represent soil forming factors. Unsupervised classification techniques were used to recognize existing soil-landscape patterns and to develop an initial sampling plan. Knowledge-based classification and classification tree analysis were used to develop models predicting soil map unit distribution. The output images generated from the knowledge-based and classification tree models produced similar predictions of soil patterns across the landscape, with slightly different predictions of soil map units. However, the knowledge-based model was much more time-intensive than the classification trees, and failed to classify all pixels within the study area even after multiple iterations of the model. Classification tree analysis was successfully integrated into the methodology, and is more objective than the knowledge-based classification. Although finals maps were slightly different, both models were transparent and could be further refined as additional data becomes available or as land-use needs change.

Peer-Led Team Learning in the Instruction of Organic Chemistry, **HALA SCHEPMANN and LYNN KIRMS** (Department of Chemistry, Southern Oregon University, 1250 Siskiyou Blvd., Ashland, OR 97520).

Peer-Led Team Learning is employed in Southern Oregon University's Majors Organic Chemistry Course to facilitate student comprehension of the subject matter. Former Organic Chemistry students serve as peer mentors who guide weekly problem-solving workshops for current students. Workshops improve student comprehension of the topic, encourage student accountability, and provide an opportunity for interaction and discussion with other students. Benefits to peer mentors include gaining a deeper understanding of the material and developing active learning teaching skills.

Efforts toward the Preparation of $(Sb_2Te_3)_x(TiTe_2)_y$ Superlattices, **BENJAMIN A. SCHMID, CLAY D. MORTENSEN, RAIMAR ROSTEK, and DAVID C. JOHNSON** (Department of Chemistry and Materials Science Institute, University of Oregon, Eugene, Oregon 97403).

Synthesis of $(Sb_2Te_3)_x(TiTe_2)_y$ superlattices with varying ratios of x and y were targeted using the technique of modulated elemental reactants. This system parallels $(Bi_2Te_3)_x(Sb_2Te_3)_y$ and PbTe/PbSeTe nanostructured materials, which have both been found to have enhanced figures of merit as a result of a reduced thermal conductivity. Seeking figures of merit at the same or higher value provided the motivation for our investigation of the title system. The approach used to optimize the Sb/Te and Ti/Te ratios, and to determine the required absolute amounts of material necessary to deposit specific $(Sb_2Te_3)_x(TiTe_2)_y$ samples will be presented. Characterization of our samples using x-ray reflectivity and x-ray diffraction, differential scanning calorimetry and electron probe microanalysis will be presented. The evolution of both structure and properties as a function of annealing temperature, time, and absolute amounts of material deposited will also be discussed.

The Temporal Effects of Ulex europaeus *on Soil Properties, and Modeling Impact of Invasive Species with Respect to Time,* **BRONWYN SCOTT and SARAH E. REICHARD** (College of Forest Resources, University of Washington, Seattle, 98195; E-mail: bronwyns@u.washington.edu).

Invasive plants contribute to biodiversity loss and cause extensive economic damage and costs. Understanding the ecological impacts of invaders and why they are capable of displacing other species and communities is a priority. Much emphasis has been placed on the effects of invasives on ecosystem, community and population levels at a single point in time. However, these plants can continue to have effects as they stay resident. Gorse (*Ulex europaeus*) is invasive in many parts of the world. This research examined gorse's ability to alter the soil properties, and was done on the Washington coast, where gorse is found growing on sand. In order to determine the age of gorse stands, the progression of invasion over time was assessed by counting annual rings in the stems. Invaded and univaded areas were compared, and gorse plants were selected randomly. From ring count, the gorse established in this area around 26 years ago. Significant linear regressions were found of soil properties over time, clearly showing that key soil properties, such as organic matter, pH and nitrogen had changed in a relatively short period of time. These unique results are part of the empirical evidence needed to evaluate the current status of ecological impact models. Current modeling treats impact as a discrete, not a continuous event. With improvements in impact models, recommendations can be made for more precise prediction, assessment and management of invasives as well as improved recovery of processes to facilitate easier restoration once invasives are removed.

Ferromagnetic Semiconductors for Prospective Spintronics Applications, **BJOERN SEIPEL[1], AMITA GUPTA[1,2,3], CHUNFEI LI[1], K. VENKAT RAO[2], NIGEL D. BROWNING[3,4], ROLF ERNI[4*] and PETER MOECK[1]** ([1]Department of Physics, Portland State University, P.O. Box 751, Portland, OR 97207-0751; [2]Department of Materials Science, The Royal Institute of Technology, Stockholm; [3]National Center for Electron Microscopy, Lawrence Berkeley National Laboratory; [4]Department of Chemical Engineering and Materials Science, University of California-Davis, Davis, CA, *now at FEI Electron Optics, Eindhoven; E-mail: bseipel@pdx.edu).

Following G.E. Moore's famous prediction, micro- and optoelectronic devices were reduced in size in order to achieve higher operation speeds and enhanced performance. As this shrinkage proceeds, the design parameters are impacted in such a way that the materials in current use are pushed to their classical physics determined operation limits. Alternatives are to render the individual components multifunctional and to implement quantum mechanical operation principles such as using the spin of electrons as an additional degree of freedom. After a brief introduction to spintronics materials and applications, results of a variety of structural studies on ferromagnetic oxides (P. Sharma et al. Nature Materials 2 (2003) 673), nitrides and phosphides will be reported. Monochromated electron energy loss spectroscopy gave insights into the band structure of such semiconductors. High-resolution phase contrast and energy dispersive X-ray spectroscopy complement the electron microscopical investigations. Quantitative (Rietveld) powder X-ray diffraction analysis was extensively employed. A large part of the talk will concentrate on the applied techniques and results we obtained with them on precursors of ferromagnetic nitride powders.

Children's Early Socialization Experiences in Urban Coffeehouse, **DEBORAH ANN SHOEMAKER** (Washington State University – Tri-Cities, 2710 University Drive, Richland, WA 99354; E-mail: dashoemaker@charter.net).

Coffeehouses are frequented increasingly by young adults, aged 20 to 40, often with children. They are designed to induce visits and promote the establishment as a meeting place. They provide tables and chairs for seating both indoors and outdoors, but all are aimed for the adults. Often these patrons are women, mothers with children, or parents who home school their children. As a result, they often meet with other parents and their children. The establishments have failed to provide a setting which meets the attentional needs of these children, most of whom are under the age of six. These children are often uncomfortable in the adult-sized, hard chairs, with no distractions provided of an age-appropriate level.

A national coffee retailer was selected, in a region of approximately 100,000 people. An observational study of patron behavior examined the patterns of children behaviors, including ranging from parents, mimicking adult behavior (consuming beverages, visiting) and child-like activity during the visits. Three specific outlets were selected; one in a mall, the others in a strip mall and near a grocery store. Observer was a patron, seated to unobtrusively observe behavior patterns and interactions of both children and parents during visits. Observations were made during weekday business hours and on weekends.

Findings failed to reveal the anticipated behavior: children entertaining themselves by modeling parental behavior rather than playing as children typically do (running, drawing), studying social interactions of adults around them, and consuming caffeinated beverages rather than juices which were also available.

Using GIS and Fuzzy Rule Sets for Pre-mapping Soils: The Dustbowl Quadrangle Project, Central Oregon, **SHEILA SLEVIN, ED HORN and JAY S. NOLLER** (Department of Crop and Soil Science, Oregon State University, 3017 ALS, Corvallis, Oregon 97331; E-mail: sheila.slevin@oregonstate.edu).

The Dust Bowl Quadrangle Project is a joint effort by the Bureau of Land Management and Oregon State University to develop a methodology for using GIS to enhance the preparation of preliminary mapping units for BLM soil survey efforts in Central Oregon. For this project, interviews with field scientists provided the basis for developing a fuzzy rule set regarding soil-landscape relationships. This rule set was used to delineate map unit boundaries through analysis of digital elevation models, digital orthophoto quadrangles, and other geospatial datasets. As part of this analysis, an experimental classification system for landform types was developed. Accuracy of the preliminary map units and landform classification system was performed by field checking. The methodology developed in the project will be used to prepare preliminary mapping units for other soil survey areas.

An Annealing Study of $(Bi_2Te_3)_x(TiTe_2)_y$ Superlattices, **MARY SMELLER, STACEY STANDRIDGE, and DAVID C. JOHNSON** (Department of Chemistry and Materials Science Institute, University of Oregon, Eugene, Oregon 97403).

Initial measurements of a $(Bi_2Te_3)_5(TiTe_2)_4$ superlattice show that with increased annealing time and temperature the Seebeck coefficient rises, the resistivity falls, and the superlattice period decreases. We hypothesize is that these changes result from a decrease in carrier concentration due to a reduction of defects in the sample. To determine if this result is representative, a series of $(Bi_2Te_3)_x(TiTe_2)_y$ superlattices were deposited and annealed at 225°C over increasing time intervals. The evolution of the structure and properties of these samples as a function of annealing time will be presented.

The Pattern and Antiquity of Regional Genetic Continuity in Native North America, **DAVID GLENN SMITH and JOHN W. MCDONOUGH** (Molecular Anthropology Laboratory, University of California, Davis, CA 95616; E-mail: dgsmith@ucdavis.edu).

The mitochondrial DNA (mtDNA) of most, if not all, fullblood Native Americans, exhibits diagnostic mutations characteristic of one of five different maternal lineages (A,B,C,D and X), called haplogroups, that are also found in Asia. These mutations include restriction sites, identifiable by digesting mtDNA with restriction enzymes, and one length polymorphism. The frequency distributions of these five haplogroups vary considerably in the New World exhibiting a distinct pattern of regional continuity. The members of each lineage also share specific mutations in the rapidly evolving control region, the presence of which can be used to verify assignment to haplogroups based on restriction analysis, and exhibit additional control region mutations that characterize specific haplotypes, or small groups of closely related haplotypes, shared with members of other closely related, or geographically proximate, tribes, other members of the same tribe, or only close matrilineal relatives.

Each haplogroup is believed to have descended from a single haplotype present in the founders of Native America, and virtually all the diversity among different haplotypes in the same haplogroup is believed to have accumulated after the settlement of the New World. The similar levels of haplotype diversity among the five haplogroups and the wide geographic distribution of specific haplotypes unique to the New World suggest it was settled by a single migration.

Studies of mtDNA of skeletal remains of prehistoric Native American populations suggests a long history of regional continuity consistent with a very early dispersal of tribal groups followed by a long period of isolation with genetic drift and limited gene flow leading to a pattern of regional continuity. In some instances, comparisons of haplogroup frequency distributions between modern and prehistoric populations from the same geographic location have provided evidence of migrations or population replacements. The frequencies of shared haplotypes is higher, and the levels of diversity among the haplotypes of the same haplogroup is lower, in modern than in prehistoric populations. This suggests that population decline associated with European contact led to a significant loss of genetic heterogeneity in Native America.

Blister Rust: Developing Resistance to a Non-Native Tree Disease, **RICHARD A. SNIEZKO** (USDA Forest Service, Dorena Genetic Resource Center, 34963 Shoreview Road, Cottage Grove, OR 97424; E-mail: rsniezko@fs.fed.us).

Cronartium ribicola, a non-native pathogen that causes white pine blister rust, has been present in western North America for nearly 100 years. Recent surveys of Crater Lake National Park (CLNP) and surrounding areas show that whitebark pine (WBP), western white pine (WWP) and sugar pine (SP) are in decline, with white pine blister rust being the major contributor to mortality. Previous work in WWP and SP (CLNP populations not sampled) indicate that there are very low frequencies of genetically resistant trees. These WWP and SP resistant trees have been incorporated into breeding programs as well as into seed orchards. However, little baseline information is available on the underlying levels of genetic resistance to blister rust in WBP. The first seed collections from individual WBP trees in CLNP (a small collection of cones from 10 trees collected in 2003), along with collections from many other locations in Oregon and Washington will allow an examination of levels and frequency of resistance. Germination of seed has been good and resistance trials have just begun. Seedlings from CLNP will be inoculated with blister rust at Dorena Genetic Resource Center in either fall 2005 or 2006, and assessed for resistance for the following five years. Development of resistant populations of five-needle pines is the principal hope to restore them in ecosystems where they have been decimated. Protecting confirmed resistant trees from other sources of mortality will also aid in restoration.

Effect of Counterion Variation in NMR Studies of Reverse Micelles, **JESSE STEINMAN, WADE VAN HORN, and PETER FLYNN** (Chemistry Department, Southern Oregon University, Ashland, OR 97520; E-mail: steinmanj@students.sou.edu).

Information regarding the structure and dynamics of biomolecules such as proteins and nucleic acids is an indispensable part of nearly all aspects of modern biochemical research and study. Nuclear magnetic resonance (NMR) spectroscopy plays an essential role in the elucidation of the construction and activity of such biopolymers. However, the utility of NMR experiments may be limited by several chemical and physical factors, the most important of which is large molecular size.

To address this, a novel NMR sample preparation technique has been developed in which a biopolymer is contained within a surfactant shell (similar to dirt contained within a detergent micelle) and dissolved into a low-polarity solvent (which flips the micelle inside out, keeping the protein inside). As low-polarity solvents have a lower viscosity relative to water, the encapsulated biopolymer may tumble faster in solution, which leads to better NMR data. Previous experiments have demonstrated that reverse micelle encapsulation is amenable to NMR studies (Wand et al., 1998), and allows for conservation of native structure and function of the enclosed biopolymer (Babu et al., 2001).

In this work, the hydrodynamic properties of empty reverse micelles were studied using NMR experiments. A series of micelles incorporating different counter cations (Na^+, K^+, and Mg^{2+}) into the surfactant sulfosuccinate (abbreviated as AOT) dissolved in pentane was prepared, and the affects of counterion variation on micelle size and stability were

ascertained from NMR data. Reverse micelles formed from Na(AOT) were found to be the most stable and adept at incorporating water into their core.

Sources:

Babu, C.R., Flynn, P.F., and Wand, A.J. (2002) *J. Biomol. NMR*, **25**, 313-323.

Wand A.J., Ehrhardt, M.R., and Flynn, P.F. (1988) *Proc. Natl. Acad. Sci, USA*, **95**, 15299-15302.

Some Implications of Seasonal Water Column Stratification at Deception Island and in the Bransfield Strait, **ANNE STURZ** (Department of Marine Science, University of San Diego, 5998 Alcala Park, San Diego, CA 92110-2496; E-mail: asturz@sandiego.edu).

Study of marine ecosystems along the western margin of the Antarctic Peninsula is important because interaction between physical and biogeochemical systems may have important implications for global carbon budget and climate change. Sea water temperature, salinity, relative density and dissolved nitrate, ammonia, phosphate and silica data acquired during five cruises to Deception Island and Bransfield Strait (1999-2000) provide a view of one annual cycle of water column properties. Macronutrients distributions within the bay at Deception Island can be explained by physical processes in late fall, winter and early spring and reflect biological processes during austral summer. In late winter/early spring, the entire water column was well mixed. During austral summer the water column was well stratified, dissolved nitrate, phosphate and silica exhibited surface depletion and deep enrichment and dissolved ammonia had a shallow subsurface maximum. By late fall, erosion of stratification was apparent by deepening of the nearly uniform mixed layer until the entire water column was well mixed. Similar physical changes in water column stratification were seen in Bransfield Strait. The transition from well-mixed to well-stratified water column occurred between November 6th and 10th , 1999 and between November 22nd and 28th, 2000. Biomass was larger within the bay at Deception Island in November 2000 than in November 1999. The time-gap between light threshold, commencement of seasonal primary production, and the onset of seasonal water column stratification may provide further clues toward understanding the interannual and interdecadal variation in physical and biogeochemical interactions in the western Antarctic Peninsula region.

The Dental Amalgam Controversy: An Opportunity to Promote Critical Thinking for Introductory Chemistry Students, **RONALD H. SWISHER, KATHLEEN SALE, ROSE MCCLURE, and CHRISTY VAN ROOYEN** (Natural Science Department, Oregon Institute of Technology, Klamath Falls, OR 97601; E-mail: swisherr@oit.ed).

Many students enter college with extensive experience using internet search engines. However their abilities to critically evaluate the information on the internet is considerably less well developed. The controversy about the mercury content of dental amalgams provides an excellent opportunity to point out some of the pitfalls of using internet sources as the primary (or only) source of information. The controversy over dental amalgams has a long and acerbic history dating from the time of their use in the early 19th century. Doing an internet search on mercury in dental amalgam will provide approximately 100,000 sites, virtually all of them negative and often repetitive. Some of these sites opposing the use of amalgams are authored by dentists and other health professionals and document their claims with references to professional journals. The web site sponsored by the American Dental Association provides assurances that dental amalgams are safe, but does not provide effective detailed rebuttal to the many allegations made by amalgam opponents. A small number of articles reviewing these allegations and providing evaluations of their validity are available in the professional dental journals but are easily overlooked. For the last three years we have assigned this topic in the first term of an introductory chemistry course for health technology students. After the students do an initial internet search assignment the first week, additional information resources are provided and students are encouraged to critically evaluate the conflicting claims and the data supporting those claims. Although in-depth evaluation of all the conflicting arguments is impossible, the students gain a much better appreciation for the complexity of this issue and the difficulties in adequately evaluating conflicting data.

The Language Instinct, The Film Instinct: An Investigation, **AMY E. TILLMAN** (Georgia State University, One Park Place, Suite 1040, Atlanta, Georgia 30303; E-mail: amycocoa@bellsouth.net).

Today, language is viewed, not as a cultural artifact, but instead as a piece of the biological make-up of our brains. Language is a complex, specialized skill which develops spontaneously, is put into action regardless of underlying logic, and is qualitatively the same in every individual. Remarkable advances in biology, neuroscience and linguistics have led to a rebirth of research on language evolution in the last decade. The literature provides a broad overview of the current state of linguistic affairs, focusing on major points of consensus as well as existing controversy. If we can establish the evolution of language, we can see its instinctual nature. In this way, studies in linguistics are important because they provide scientific evidence for the language instinct, a map, as it were, which can be used in establishing not only the language instinct, but the film instinct as well.

Film has been called a language. If this is so, then, metaphorically, film must be instinctual as well. There exist commonalities between editing as a grammar and film as a language system. The “language” of film is not simply a construct, it is created through a natural process akin to the language instinct. Filmmaking is more like language

acquisition than information processing. Film can easily be held up to the same standards of explanation and exploration as is spoken language. To create a complete definition of film, it must be looked at as being instinctual.

Response of Ectomycorrhizal Fungal Fruiting Patterns to Different Fire Prescriptions at Crater Lake National Park, **MATT TRAPPE and KERMIT CROMACK, JR**. (Department of Environmental Sciences, Oregon State University, Corvallis, OR 97331; E-mail trappem@onid.orst.edu).

Ectomycorrhizal fungi are a vital element of healthy forests, essential to trees for disease resistance and efficient uptake of water and nutrients. The sporocarps of ectomycorrhizal fungi (mushrooms and truffles) are also an important part of the food web, comprising the majority of the diets of many small mammals and supplementing the diets of larger animals. Prescribed fire is an important tool to return fire-excluded stands to their natural fuel levels, facilitating resumption of the natural fire cycle and reducing future risk of stand-replacement wildfire.

Our research examines the response of ectomycorrhizal fungal fruiting patterns to three different fire prescriptions (early spring, late spring, and fall burns, with unburned controls) at Crater Lake National Park. The forest is old-growth ponderosa pine with a white fir understory. Each treatment has four replicated plots of about three hectares. We are sampling the sporocarps found in each treatment in the spring and in the fall, and have completed two years of data collection. Mineral soil and litter samples are being analyzed for density, carbon and nitrogen content, and isotopic signature.

Preliminary data suggest that the early spring burn prescription significantly increased fungal productivity and marginally increased diversity over control plots. The productivity and diversity following late spring burns were comparable to controls, and the fall burn treatment decreased diversity and productivity relative to controls. Needle litter mass was significantly lower in the early spring burns than the controls, and the late spring and fall burns were significantly lower than the early spring burns.

Validating the Construct of Science Achievement by Using Logical and Factor Analyses, **SHIN-PING TSAI and MIN LI** (College of Education, BOX 353600, University of Washington, Seattle, WA 98195; E-mail: sptsai@u.washington.edu).

The goal of this paper is to validate a knowledge framework for conceptualizing and measuring science achievement. In this framework, we proposed to define the construct of science achievement as four interdependent types of knowledge: declarative knowledge (knowing that), procedural knowledge (knowing how), schematic knowledge (knowing why), and strategic knowledge (knowing about knowing) (e.g., de Jong & Ferguson-Hesser, 1996; Li & Shavelson, 2000). We conducted both logical and covariance analyses, using science items from the Trend of International Mathematics and Science Studies–Repeated (TIMSS-R), to validate this knowledge framework on the basis of the assessment model recommended by Pellegrino, Chudowsky, and Glaser (2001). First, we generated a profile of item characteristics for each item by logically coding the science items and accordingly mapped the items into the knowledge type(s) the students may apply when responding to those items. The logical analysis found that declarative knowledge was heavily loaded in the test items whereas none of the items tested strategic knowledge. Examples of item characteristics and knowledge types will be presented to illustrate our coding procedures. Second, after classifying the test items, we performed a set of confirmatory factor analyses to validate the posited item-knowledge links, assuming that items measuring the same knowledge type cluster together. The factor analyses confirmed the item classifications from the logical analysis. Finally, suggestions and implications will be provided for classroom teachers in assessing their students' science achievement and developing valid assessment tools. Further steps for validating the knowledge framework will be discussed as well.

Algal Bioremediation of the Berkeley Pit Lake System: An In-Situ Test Using Limnocorrals, **NICHOLAS J. TUCCI and GRANT G. MITMAN** (Departments of Biology and Geochemistry, Montana Tech of The University of Montana, Butte, MT 59701; E-mail: NJTucci@mtech.edu).

Through various metabolic, physiological, and biochemical processes, algae have the potential to reduce soluble metal ions in acid mine waters. The Berkeley Pit Lake is an extremely acidic (pH~2.5) metal laden polluted body of water located in Butte, Montana, near the headwaters of one of the largest U.S. Environmental Protection Agency Superfund sites in the United States. To properly test bioremediation potential of indigenous algae in the pit, an *in-situ* experiment was performed, using nine, 1m—by—3m polyethylene acid/metal resistant limnocorrals. Limnocorrals are an enclosed experimental apparatus; used to simulate actual physical, chemical, and biological conditions of the lake environment within a controlled volume of water, allowing for manipulation of one to several aspects of the natural environment.

On June 15, 2004, nine limnocorrals were deployed into the Berkeley Pit Lake system. Experimental manipulation in this experiment consisted of nitrification of limnocorrals using nitrate and phosphate concentrations to stimulate algal growth. It is hypothesized that if properly nutrified, dissolved metal concentrations in the Berkeley Pit will decrease due to increasing algal biomass. Total algae counts, bacteria counts, dissolved metal analysis, and various physical parameters were monitored over a six month course. Nutrified limnocorral

(2-levels) were compared to non-nutrified (control) limnocorrals to determine if eutrification of the Berkeley Pit is a viable option for remediation.

This work was performed under the Mine Waste Technology Program, funded by the U.S. Environmental Protection Agency (EPA) and jointly administered by the EPA and the U.S. Department of Energy, Contract Number DE-AC22-96EW96405.

Cardiological Comparison of the Mytilus *Genus,* **CHASE WARNER** (Hopkins Marine Station, PO Box 1588, Pebble Beach, CA 93953; E-mail: chase_warner@rlstevenson.org).

In this experiment, the cardiological threshold of the *Mytilus californianus* was determined through various temperature ramps in a Lauda water bath and compared to similar *Mytilus* species. The results of this experiment have a direct correlation to global warming, with its concurrent rising of ocean temperatures and the range of the *Mytilus* genus that: A) the *M. californianus* has a higher heat threshold than the bay mussels (*M. trossulus*, *M. galloprovincialus*, *M. edulis*) (Braby, 2004; Pickens, 1965); B) the *M. californianus* has a worse cold threshold than the bay mussels (Braby, 2004; Pickens 1965). This data is based on the ABTs, Arrehnius break temperatures, which looks at the oxygen consuming activity of the mitochondria, signaled by a major drop in heart function of the *M. californianus* and other species of the same genus. By studying this mussel, I was able to determine its heat threshold and how this mussel would likely survive as ocean temperatures increase. Though additional research needs to be conducted, this experiment gives an indication on how an invasive species coupled with environmental changes (i.e. global warming) can have a substantial impact on the natural habitat, especially for the *Mytilus* genus.

Structural and Community Development Following Severe Wildfire in a Montane Forest, **JOHN K. WILSON[1], and J. BOONE KAUFFMAN[2]** ([1]Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR 97331; [2]Institute of Pacific Islands Forestry, USDA Forest Service, PSW Research Station, Honolulu, HI 96813; E-mail: wilsonj5@onid.orst.edu).

Wildfire is the most significant disturbance in the forests of southwestern Oregon. Developing forest structure and composition depend on the interrelationships of disturbance characteristics, life history traits of available species, and environmental conditions. Unlike productive, lower elevation forests in the Pacific Northwest, the study sites at Crater Lake National Park are characterized by short growing seasons, heavy winter snowpacks and recent volcanic soils. The objectives of this study were to characterize structural and compositional development on similar montane forest sites following severe wildfire. Six sites were selected in the mountain hemlock-Shasta red fir forest representing a chronosequence of wildfire and forest development from 1 to 200+ years. Five additional sites represent the mature forest. Three 0.2 ha plots were established at each site in which all measurements were collected. In addition to significant tree biomass consumption, fires consumed 80% of the litter layer. Fallen snags spiked the large downed wood at the 24 year site (120 Mg/ha) compared with mature forest sites (36 Mg/ha). The initial herbaceous flush materialized slowly, and lupine was the most characteristic herb during seral stages. Sparse and extended seedling establishment (2000 stems/ha) after 8 years, contributed to early seral vertical complexity. Along with high overstory morality, the most significant effect of severe wildfire may be the litter layer consumption, and with it, an important nutrient source in these ecosystems. Altered nutrient cycling, recent soils and demanding environmental conditions result in protracted forest development and the importance of lupine and N-fixing shrubs during seral stages.

Pleistocene Vertebrates and Cordilleran Glaciation in Southwestern British Columbia: Implications for Possible Early Human Migrations, **MICHAEL C. WILSON** (Department of Geology and Department of Anthropology, Douglas College, P.O. Box 2503, New Westminster, BC V3L 5B2, Canada; E-mail: wilsonmi@douglas.bc.ca).

If human groups arrived in the New World via a western coastal route, a significant portion of it was along the British Columbia coast. BC was almost completely covered by the Cordilleran ice sheet at the Last Glacial Maximum, *ca.* 16,000-14,000 radiocarbon yr BP. Vertebrate faunas are documented from both late preglacial and early postglacial times and include suites of large ungulate species that could have supported human populations with hunting/gathering economies. Coastal occurrences on Vancouver Island (Saanichton Gravels) document a preglacial fauna including mammoth, mastodon, bison, and muskoxen. Finds from Port Eliza Cave indicate a diverse terrestrial fauna with small mammals, mountain goat, birds, and toads, dating between *ca.* 18,000 and 16,000 ^{14}Cyr BP, after which Cordilleran ice reached the outer coast and covered the site. Other Vancouver Island cave finds are dated as early as 12,500 ^{14}Cyr BP and include black bear and mountain goat. Evidence from the west coast suggests that glaciers reached peak extent earlier in the north than in the south and were retreating in the north while still advancing in the south. This opens up three possibilities for human travel southward: preglacial times well before 20,000 ^{14}Cyr BP; postglacial times after 13,000 ^{14}Cyr BP; and a possible "window of opportunity" *ca.* 16,000 ^{14}Cyr BP when ice was retreating in the north and approaching the outer coast in the south. As yet, direct evidence for human presence on the BC coast is limited to postglacial finds less than 11,000 radiocarbon years old.

Using the Natural Abundance Method to Determine Biological Nitrogen Fixation by Legume Cover Crops, **JODI J. WINEMILLER, KATIE L. MONSEN, and CAROL SHENNAN** (Center for Agroecology and Sustainable Food Systems, University of California Santa Cruz, 1156 High Street, Santa Cruz CA 95064; E-mail: jodiwinemiller@gmail.com).

Biological nitrogen fixation (BNF) is an important but often elusive component of N budgets in natural and managed ecosystems. We are estimating BNF by two winter cover crop, woollypod vetch (*Vicia dasycarpa*) and bell beans (*Vicia faba*), using the natural abundance method. The natural abundance method uses reference plants to represent the $\delta^{15}N$ signature of soil N available for plant growth instead of the amount of available N. To determine the percent of N derived from the atmosphere (%Ndfa), we grew vetch and bell beans in single-species plots adjacent to plots of two reference species, oats (*Avena sativa*) and mustard (*Brassica japonica*). Based on 2002-03 trials, we suspected that a long history of using legume cover crops lowered the soil $\delta^{15}N$, making it similar to the $\delta^{15}N$ of the legumes themselves. In 2003-04 we grew legume and reference species in fields with a range of 0-20 years of annual legume cover cropping. The results did not show a clear relationship between $\delta^{15}N$ and field cover crop history. To further explore these unexpected results, we are examining the correlation between plant ^{15}N composition and soil N availability. In 2004-05 we repeated the field experiment with the addition of four fertility treatments for subplots of woollypod vetch and oats. Sample analysis is nearly complete and we anticipate the data will help us evaluate the appropriateness of this method for legume-intensive farms.

Agroforestry Systems and Soil Nutrient Reserves in Talamanca, Costa Rica, **LEIGH WINOWIECKI and PAUL McDANIEL** (University of Idaho, Department of Plant, Soil, and Entomology, P.O. Box 2339, Moscow, ID 83844-2339; E-mail: wino3301@uidaho.edu).

Agroforestry systems offer multiple benefits to nutrient-limited and acidic soils of the humid tropics. These benefits include reduced soil erosion, maintenance of soil organic matter, and replenishment of soil nutrients. Talamanca, Costa Rica, in particular, implements several types of cacao agroforestry systems within a diverse landscape. Yet, little to no soil research has been conducted in this region. The objective of this study is to understand the nutrient sources and thus, nutrient cycling of macronutrients within the soil ecosystem under cacao agroforestry systems. Calcium, magnesium, and potassium stocks will be quantified in the primary mineral, exchangeable, and soluble form. Thus far these data suggest that soils on the back slope position in the foothills have a low capacity to store or exchange bases. These soils have effective cation exchange capacities (ECEC) between 4 and 8 cmol/kg in the top 20 cm of the soil profile. These soils also have high aluminum saturation values (40-80%). In contrast, alluvial soils from a back slope position have higher effective cation exchange capacities (22-34 cmol/kg) and lower aluminum saturation (<18%) in the upper A horizons. These data suggest limited quantities of macronutrients in labile and primary mineral reserves. The significant role of parent material on soil chemical properties is also illustrated. Finally, these data stress the importance of maintaining soil organic matter as a source of labile nutrients in highly weathered soils.

The Application of System Engineering Principles and Practices to Systems Biology, **LAWRENCE H. WOOD** (Systems Engineer, Retired, 8433 Camano Loop NE, Lacey, WA 98516; E-mail: marylar@comcast.net).

Systems biology offers exiting improvements in our understanding of complex, bio-medical systems (Kitano, 2001, 1662). System engineering principles/practices, created for the development of "inanimate systems", offer a novel, complimentary approach to further enhance the promise of systems biology. As noted by (Csete et al, 2002 1664) *Advanced technologies and biology have extremely different physical implementations, but they are far more alike in systems-level organization than is widely appreciated.* Applicable systems engineering principles/practices include: 1. clear definition of a system; 2. system development procedures – the–"systems approach": requirements generation, concept development, system design, fabrication and testing; 3. reverse engineering; 4. system documentation techniques, such as: 4a) block diagrams – how elements are interconnected 4b) hierarchy diagrams – top down element interrelationships. While "system" is often associated with size and complexity, a better definition of a system is: "any engineered entity that requires two or more engineering disciplines to understand." Correspondingly, a biological system is""any biological entity that requires two or more, typically bio-medical, disciplines to fully understand". This system definition has profound implications for research organization. All system development principles/ practices are applicable to biological systems, especially research. E.g., reverse engineering, beginning with testing and disassembly (dissection in biology), plays a significant role in biomedical research as recognized by Csete et al, (2002, 1664). The "design method employed by evolution" is easily seen to be trial and error. This paper will demonstrate that, beginning with requirements analysis, this "design method", when applied to satisfy that most basic biological system requirement, survival, leads logically to the extant human body plan, the requirement for sexual reproduction and important aspects of human behavior such as warfare.

Assessing Recovery from Salinity Induced Stress in Water Hyacinth, **PHILLIP WUNDER II and STEPHEN P. ANDREWS, JR.** (Environmental Sciences Teaching Program, University of California, Berkeley, 301 Campbell Hall, Berkeley, CA 94720; E-mail: paw2@berkeley.edu).

Water hyacinth, *Eichhornia crassipes*, is recognized as one of the world's most noxious aquatic invasive species. With the ability to exist under a wide range of freshwater environmental conditions, the spread of water hyacinth in estuaries and tidally influenced marshes is limited by salinity. Refined knowledge of the acute sensitivity of water hyacinth to salinity may be utilized to develop new control strategies. While the literature shows the onset of water hyacinth mortality at salinity levels in the range of 6 to 8 ppt (Muramoto and Oki 1988), virtually no information exists on the ability of water hyacinth to recover from these potentially lethal levels of salinity. In this study, pre-flowering water hyacinth were exposed to salinity levels of 5, 6, and 7 ppt for durations of 7, 14, 21, and 28 days. After exposure the plants were placed in freshwater for 14 days. Wet plant weight and leaf chlorophyll were used as indictors of water hyacinth health. The multiple linear regression of weight on salinity, exposure duration, recovery, and interactions explained 77% of the variability in weight and was highly significant ($p<0.0001$). Recovery did not significantly affect leaf chlorophyll. Recovery rates were greatest for water hyacinth experiencing the shortest exposure times at the lowest salinity levels. This study determined that the base level needed for water hyacinth mortality where no recovery would occur is an exposure of 21 days at 7 ppt salinity.

The New Guinea Singing Dog – Not a Dingo Hybrid, **BONNIE C. YATES[1] and JANICE A. KOLER-MATZNICK[2]** ([1]U.S.F.W.S. National Fish and Wildlife Forensics Laboratory, 1490 East Main, Ashland, OR 97520; E-mail: bonnie_yates@fws.gov; [2]The New Guinea Singing Dog Conservation Society, 5265 Old Stage Road, Central Point, OR 97502; E-mail: jkoler@ccountry.com).

Recently, Laurie Corbett (2004) used his Y formula values to justify calling the entire captive New Guinea Singing Dog (*Canis hallstromi*) population dingo/domestic dog hybrids. We investigated the question: Does the Y-value morphometric formula, developed by Corbett (1995) as the hub of a set of criteria intended to determine pure Australian dingoes (*Canis [familiaris] dingo*) from domestic dogs (*Canis familiaris*) and their hybrids, correctly assign domestic dogs of morphotypes that were not in the original reference populations, and does it allow us to recognize other non-dingo canid species? If not, then is it proper to use the Y formula to determine the taxonomic status of geographically separated, morphologically divergent canid populations of uncertain ancestry, like the New Guinea singing dog? The skulls of 24 known-breed domestic dogs [dds], two *Canis latrans*, three north American *Canis lupus*, one *Canis rufus*, one *C. l. baileyi*, and one known *C. lupus/C. familiaris* hybrid were measured with digital calipers to two decimal points, as described in Corbett (1995:189). Taken together, the Corbett formula, with his three additional non-parametric criteria, seem to be extremely useful for determining the taxonomic status of wild dogs in Australia. However, our examination shows that Corbett's Y formula is only accurate when determining Australian dingoes from the types of domestic dog that formed the original domestic dog reference population. Therefore, it is inappropriate to use this formula to determine the dingo ancestry or the taxonomic status of any other canid populations.

CalPEERS: Innovatove Peer-based Instruction and EIC Learning for Urban Schools, **TANNER Y.W. ZANE, PAMELA Z.F. HAN and WILLIAM B.N. BERRY** (Environmental Sciences Teaching Program, University of California, Berkeley, 301 Campbell Hall, Berkeley, CA 94720; E-mail: tywzane@yahoo.com).

Preserving and expanding educational outreach programs at the high school level is essential for closing the widening educational gap between urban and suburban schools (Lieberman and Hoody, 1998). Undergraduate instructors in CalSci, a UC Berkeley campus-based science academy for disadvantaged youth, recently created a parallel outreach program called CalPEERS which not only provides intense science instruction to disadvantaged students, but also helps them become peer-mentors within their home schools. This innovative program was initiated in 2004-2005. The first cohort of peer-mentors was trained to provide tutoring in biology, chemistry, physical and earth science. This education supplied the students with a sound foundation in the sciences as well as knowledge of different teaching methods. These high school students designed classroom lessons and activities that were practiced during CalSci sessions. In the 2005-2006 academic year, peer-to-peer teaching will commence in several Bay Area high schools. Partnering schools will host after-school sessions where peer instructors will work in small groups with students from their home school. The long-term goal is to raise academic performance in the sciences through mini-lessons, intensive tutoring, and peer-mentoring.

The Antiplague Systems of Central Asian and Caucasus Nations: Uncertain Defense Against Especially Dangerous Infectious Diseases, **RAYMOND A. ZILINSKAS** (Center for Nonproliferation Studies, Monterey Institute of International Studies, Monterey, CA 93940; E-mail: rzilinskas@miis.edu).

The former Soviet Union's antiplague system had four main objectives; monitor natural foci of endemic diseases such as plague, tularemia, anthrax, and Crimean-Congo hemorrhagic fever; prevent importation of exotic diseases

(e.g., cholera and smallpox); protect against biological warfare; and supply pathogens to the military. This system disintegrated in 1991, but elements were incorporated into health systems of newly independent states. Center for Nonproliferation Studies (CNS) analysts have investigated Central Asian and Caucasus antiplague systems for two years, including having visited 40 antiplague institutes and stations. Findings will be reported on possible threats that antiplague scientists, pathogen collections, and equipment pose to international security, as well as promises antiplague systems hold for enhancing international public health, should they regain their former level of scientific/technical capability.

Several U.S. government agencies support activities to increase the level of biosecurity and biosafety at antiplague facilities, as well as their public health capabilities. In this regard, the Nunn-Lugar Cooperative Threat Reduction (CTR) program is especially important and valuable. CTR, as well as activities supported by the Departments of State and Energy, will also be reviewed. As will be seen, the need for resources by national antiplague systems is great, but the flow of assistance is scant. If this trend continues, the deterioration of facilities and probable brain-drain will result in increased security and public health threats to Europe and Russia.

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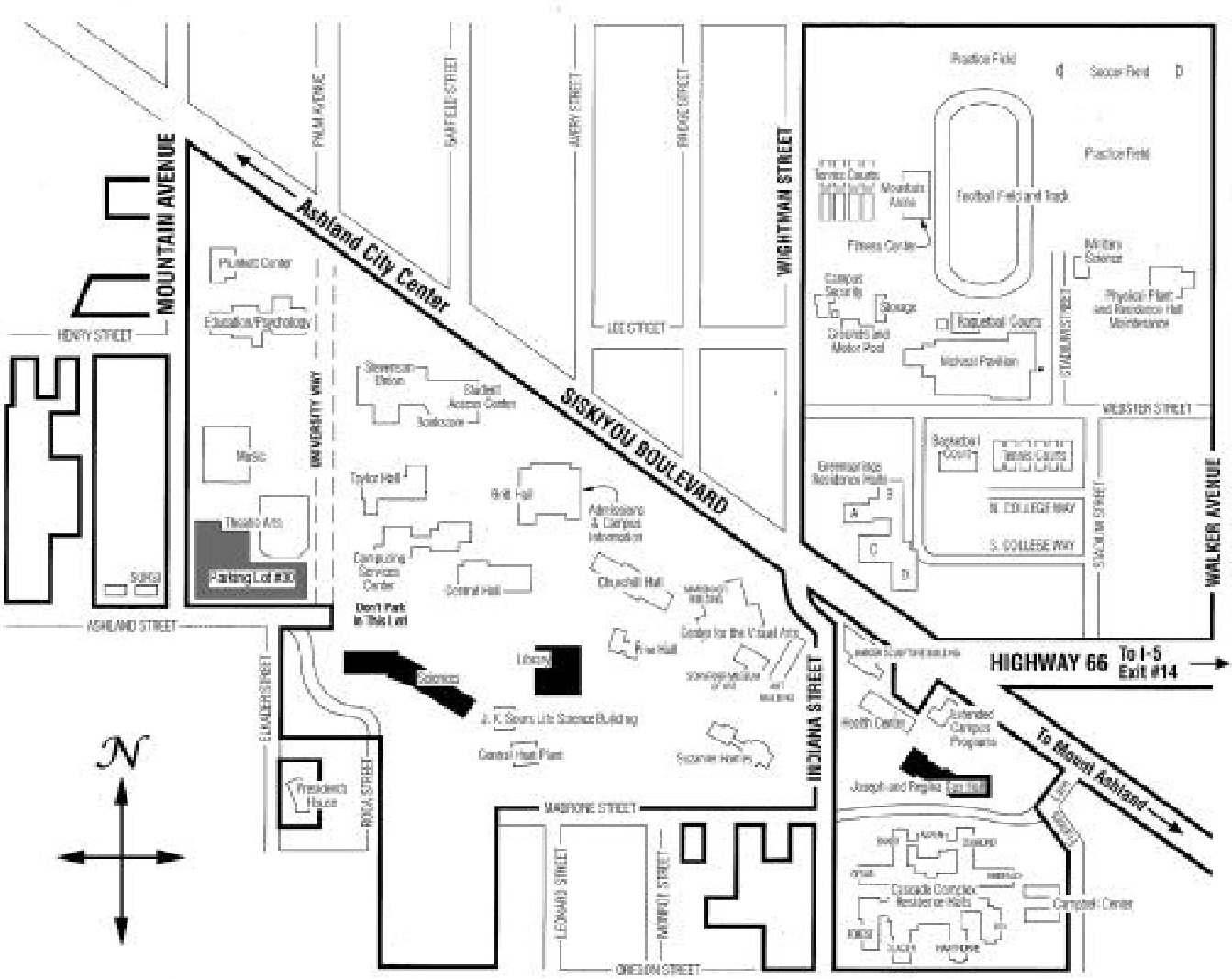

Southern Oregon University

The Sciences Building, in which the majority of the meeting will occur, is colored black. So also are the Hannon Library, location of the poster session, Monday evening talk and SOU Presidential reception, and Cox Hall, the on-campus residence hall in which some registrants are staying. The Hannon Library is just to the east of the Sciences Building. Cox Hall is further east, about a leisurely six minute walk from the Sciences Building.

Parking: Those who drove and are staying in Cox Hall need to purchase a $10.00 permit at check-in, which allows them to park in the lot in front of the residence hall (and other selected lots on the SOU campus) for the week. Complimentary parking for meeting registrants not staying on campus is provided in Parking Lot #30 (see gray-colored area just to the northwest of the Sciences Building on the map). Do not park in the large parking lot in front of the Sciences Building (Parking Lot #27 on maps)! If you do, you will almost certainly receive a parking ticket. There is also quite a bit of on-street parking around the Sciences Building, which is free.