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Twelfth Annual ALS Users' Association Meeting

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Science took the front seat as 219 Advanced Light Source (ALS) users and staff gathered on Monday and Tuesday, October 18 and 19 for the twelfth annual users' meeting. The bulk of the meeting was dedicated to reports on science at the ALS, Packed into two busy days were 31 invited oral presentations and 80 submitted poster presentations, as well as time to visit 24 vendor booths. The oral sessions were dedicated to environmental science, chemical dynamics, biosciences, magnetic materials, and atomic and molecular science. In addition, there was an ALS highlights session that emphasized new results and a session comprising highlights from the young scientists who will carry the ALS into the future. Lengthy lunch breaks held on the patio outside the ALS lobby on both days of the meeting allowed ample time to peruse the vendor exhibits and take in poster presentations, as well as visit the ALS.

Monday morning opened with a welcome from Berkeley Lab Director Charles Shank. Patricia Dehmer, Associate Director for Basic Energy Sciences at the U. S. Department of Energy (DOE) spoke of impressive progress at the ALS and an upcoming DOE review of the ALS (now scheduled for February 2000) that may lead to increased funding. ALS Director Daniel Chemla provided a detailed overview of planning for new beamlines and end stations to conduct twenty-first century science at the ALS, as well as a breakdown of how the facilities spends the money it currently has. After Stephen Kevan [University of Oregon and 1999 Chair of the Users' Executive Committee (UEC)] conducted a brief user business meeting, David Attwood, Director of the Berkeley Lab Center for X-Ray Optics (CXRO), contributed a moving remembrance of CXRO colleague and former UEC Chair Werner Meyer-Ilse, who died last summer (see SRN 13.1, pg. xx).

Oral scientific presentations began after a short break on Monday with the session on ALS highlights. Eli Rotenberg (ALS) started things off by showing it was possible to measure large electron-phonon effects in angle-resolved photoemission in his talk on "Strong Electron-Phonon Coupling for Hydrogen Absorbed onto Tungsten (110)." Aaron Lindenberg (University of California, Berkeley) continued with a discussion of streak cameras to record picosecond measurements of "Time-Resolved X-Ray Diffraction from Coherent Photons during a Laser-Induced Transition." In his account of "Single Proton Double Ionization of D_2 Molecules Fixed in Space," Michael Prior (Berkeley Lab) showed how to reconstruct the momenta of all the electrons and ions from a photoionization event in a "momentum microscope." Satish Myneni (Berkeley Lab) took a look at the way water behaves in nature in his report on "Direct Probing of H-bonding Structures in Liquid Water by Soft X-Ray Spectroscopy." Gary Mitchell (Dow Chemical Company) finished up the session by disclosing a significant industrial impact of synchrotron radiation in the design of a new polymer plant in his presentation "Characterization of Microscopic Variations in Crosslink Density of Superabsorbent Polymers using X-Ray Microscopy."

After lunch, David Robin and John Byrd (ALS) introduced a diversion from science using synchrotron radiation to accelerator physics at the ALS in their "Status Report on Machine Physics Projects," including the project to install superconducting bend magnets (superbends) to extend the ALS spectral range and progress on the use of third-harmonic cavities in the storage ring to increase beam lifetime without decreasing the brightness.

Environmental science then took the stage, beginning with an overview by David Shuh (Berkeley Lab) of the progress toward establishing undulator and bend-magnet beamlines at the ALS dedicated to molecular environmental science (MES). Shuh's talk was titled "Status Report of the MES Project at the ALS." Alain Manceau (University of Grenoble) showed how to combine data from polarized EXAFS at the ESRF and micro-EXAFS at the ALS to determine the "Speciation of Heavy Metals in Contaminated Soils: From ESRF to ALS, and Back Again." Scott Chambers (Pacific Northwest National Laboratory) followed with a "Structure and Redox Chemistry of Well-Defined Iron Oxide Surfaces" in which he discussed the reduction of chromate ions at the water/mineral interface when clean surfaces were exposed to chromate contamination in solution. Concluding the session, Hoi-Ying Holman (Berkeley Lab) reviewed the use of infrared techniques to the cellular response to chemicals and radiation in her presentation "Development of Synchrotron Vibrational Spectromicroscopy for Assessment of Stress Response of Human Cells to Low Doses of Environmental Agents."

Winding up Monday's formal proceedings, a session on chemical dynamics. Arthur Suits (Berkeley Lab) started off with an "Overview of CD Research at the ALS" in which he discussed challenges in reaction dynamics and photochemistry of radicals, nonadiabatic dynamics, extrapolation to large molecules, and new molecules/new chemistry. Cheuk Ng (Iowa State University and Ames Laboratory) then described "The Development of a High-Resolution Pulsed Field Ionization Photoelectron-Photoion Coincidence Spectrometer at the Chemical Dynamics Beamline" and reviewed recent results that demonstrated the ability to obtain accurate chemical data. Darcy Peterka (Berkeley Lab and UC Berkeley) closed out the session with a review of "Chemical Dynamics Using Synchrotron Undulator Radiation" using as illustrations the observation of several new channels for the UV photodissociation of ethylene sulfide and preliminary results for a new ion-imaging end station now undergoing commissioning.

Awards held center stage at the Monday night banquet, held this year at the University of California, Berkeley, men's faculty club. The Klaus Halbach Award for Outstanding Instrumentation at the ALS went to Simone Anders, Rob Duarte, Greg Morrison, Howard Padmore (all of the ALS), and Mike Scheinfein (Arizona State University) for development of the PEEM2 photoemission electron microscope. The Tim Renner User Services Award was given appropriately to the members of the ALS User Services Office (Ruth Pepe, Bernie Dixon, Sharon Fujimura, Jane Tanamachi, and Barbara Phillips). Greg Denbeaux (CXRO) won the second annual student poster competition with his presentation describing spectromicroscopy capabilities of the x-ray microscope (XM-1) on Beamline 6.1.2. Roland Kawakami, Z.-Q. Qiu (both of UC Berkeley), and Eli Rotenberg (ALS) received the David A. Shirley Award for Outstanding Scientific

Achievement at the ALS for their work in fabricating novel multilayer magnetic quantum well samples and using photoelectron spectroscopy to measure their fundamental properties.

Tuesday morning's biosciences session opened bright and early with Thomas Earnest (Berkeley Lab) presenting an "Overview of the Crystallography Program at the ALS," in which he highlighted some of the important structures solved and outline planes for future beamlines and increased automation. Tina Iverson (California Institute of Technology) followed with a report on "The Structure of the Respiratory Complex II: Fumarate Reductase from *E. coli*, " a membrane protein whose structure was solved at the ALS using multiple-wavelength anomalous diffraction (MAD) to obtain phase information. Joel Ybe (University of California, San Francisco) continued with an another example of a structure that required MAD data to solve in his talk on "From Pinwheels to Baskets: Clathrin Self-Assembly." Sudip Parikh (Scripps Research Institute) the discussed studies of "Structural Cell Biology of Multi-Component Protein-DNA Complexes Essential for Genomic Stability," complexes that receive a million or so mutation-causing hits per day from ionizing radiation and chemicals. Karen McFarlane (Berkeley Lab) switched from crystallography to spectroscopy in her presentation on "Sulfur K-Edge Spectroscopy of Biomolecules" and described a new end station at the ALS for studies at photon energies around 2 to 4 keV.

After a short break, the morning proceedings continued with a session on magnetic materials. Andreas Scholl (ALS) described recent examples of the use of x-ray linear dichroism spectromicroscopy with an photoemission electron microscope to image antiferromagnetic domains in his review of "Experiments in Antiferromagnetic Materials Using PEEM2."Frank Schuhmann (Lawrence Livermore National Laboratory) reported the "Observation of Fine Structure in the Linear Dichroism of Fe 3p Photoelectron Emission" made as part of a program aimed at developing XMLD into a tool for element-specific magnetometry. Eric Shirley (National Institute of Standards and Technology) followed with a progress report on the theory of soft x-ray fluorescence, as well as several examples of "X-Ray Emission Spectroscopy of Heavy Transmission Metals and Rare-Earth Oxides." Ending the session, Joerg Schaefer (University of Oregon) described the use of angle-resolved photoemission to observe an isotropic "Spin Density Wave Energy Gap at the Cr(110) Surface."

Atomic and molecular science took the stage after lunch. Darrah Thomas (Oregon State University commenced with a presentation on "Inner-Shell Photoelectron Spectroscopy of Small Molecules at High Resolution Using the ALS," in which he extracted chemical information from line positions and shapes in detailed spectra. Oliver Hemmers (University of Nevada, Las Vegas) reported on time-of-flight measurements with multiple detectors to observe "Non-Dipolar Effects in Soft X-Ray Photoemission," as well as detecting multiple-atom resonant photoemission (MARPE), in gas-phase molecules. Orhan Yenen (University of Nebraska, Lincoln) discussed angular momentum sharing in his talk on "Measurement of Orbital and Spin-Magnetic Moments of All Active Electrons of an Isolated Multielectron System Formed by Circularly Polarized VUV Light." Ron Phaneuf (University of Nevada, Reno) closed the session with a

summary of a technique for studying the dominant state of matter in the universe in his talk "Photoionization of Ions: First Results from the Collinear Photo-Ion End Station at Beamline 10.0.1.

Highlights from young researchers was the theme of the last session of the meeting (where young in some cases meant new to synchrotron radiation). Klaus Pecher (UC Berkeley, and Caltech) started the ball rolling in an environmental direction with an eye on waste-immobilization strategies in his presentation on "Charge-State Mapping of Mixed Valent Iron and Manganese Mineral Particles Using Scanning Transmission X-Ray Microscopy." Inuk Kang (UC Berkeley) reported the observation of polaron-lattice melting in laser-irradiated samples in his talk on "Time-Resolved X-Ray Measurements of Polaron Dynamics of Charge Ordered $Nd_{0.5}Sr_{0.5}MnO_3$." Gyorgy Snell (Western Michigan University) discussed spin-resolved Auger spectroscopy in his report of "Magnetic Dipole Moment of the Xe $4d^{-1}$, $Kr3d^{-1}$, and Ar $2p^{-1}$ Holes States—First Measurements with the EPU at Beamline 4.0." Scott McHugo (ALS) summarized the results of x-ray fluorescence microprobe and micro-XANES studies of the "Chemical State of Metal Precipitates in Silicon," a subject of interest to manufactures of integrated circuits and solar cells. Vincent Lamour (UC Berkeley) finished up the session with review of "Early Age Hydration of Calcium Aluminate Cements Through Transmission X-Ray Microscopy" in which observation of the microstructure of cements was observed over several hours.

On the Wednesday after the users' meeting, two daylong workshops captured much interest. Many of the world's experts in the field gathered to discuss Future Directions in Ultra-High Resolution Spectroscopy for the Study of Complex and Correlated Phenomena. Based on the workshop proceedings, organizers Dan Dessau (University of Colorado) and Z.-Q. Qiu (UC Berkeley) are preparing a proposal for an elliptically polarized undulator beamline for angle-resolved photoemission with high spectral and momentum resolution and with spin detection. Organized by Mike Martin and Wayne McKinney (ALS), the second workshop, titled A Far-Infrared Beamline at the ALS: Future Prospects, explored the possibilities of establishing a synchrotron-based far-infrared (far-IR) program at the ALS. Topics included various methods for extracting far-IR from the storage ring and research area that could be enhanced by such a beamline.

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Greg Denbeaux (second from left) of the Berkeley Lab Center for X-Ray Optics explains a point in his prize-winning student poster at the twelfth annual ALS Users' Association meeting. (Photo: Berkeley Lab Photographic and Digital Imaging Services)

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Howard Padmore and Simone Anders (left) of the ALS accept for their co-workers the Klaus Halbach Award for Outstanding Instrumentation at the ALS for the development of the PEEM2 photoemission electron microscope from Nora Berrah (Western Michigan University and incoming Users' Executive Committee Chair for 2000, Stephen Kevan (University of Oregon and outgoing UEC Chair for 1999), and Neville Smith (ALS Division Deputy for Science). (Photo: Berkeley Lab Photographic and Digital Imaging Services)

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Appropriately enough, the winner of the Tim Renner User Services Award comprised the ALS User Services Office (Ruth Pepe, Bernie Dixon, Sharon Fujimura, Jane Tanamachi, and Barbara Phillips). From left to right: Stephen Kevan (University of Oregon and outgoing UEC Chair for 1999), Fujimura, Nora Berrah (Western Michigan University and incoming Users' Executive Committee Chair for 2000), Phillips, Gary Krebs (User Services Group Leader), Pepe, Tanamachi, Neville Smith (ALS Division Deputy for Science), and Dixon. (Photo: Berkeley Lab Photographic and Digital Imaging Services)