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1. GRK2 ENZYME HELPS KEEP G PROTEINS AT BAY

by Art Robinson

(Contacts: David Lodowski, dave@icmb.utexas.edu ; John Tesmer, tesmer@mail.utexas.edu)

G proteins in the cell serve as molecular switches for important signaling cascades, including those that control heart rate, blood pressure, and glucose metabolism and those that mediate the senses of taste, smell, and vision. The G proteins themselves are activated by G-protein-coupled receptors (GPCRs), which reside in the cell membrane and react to specific external signals, such as light or adrenaline. In order for cells to adapt to changes in their external (extracellular) environments, activated GPCRs must be rapidly desensitized. This process is initiated by G-protein-coupled receptor kinases (GRKs), enzymes that phosphorylate (add phosphate groups to) the portions of activated GPCRs that project into the cell. To study this mechanism at the molecular level, a collaboration from the University of Texas and the Duke University Medical Center has determined the crystal structure of a form of GRK in complex with portions of its target molecule.

Read the full story at http://www-als.lbl.gov/als/science/sci_archive/71gprotein.html .

Publication about this research: D.T. Lodowski, J.A. Pitcher, W.D. Capel, R.J. Lefkowitz, J.J.G. Tesmer, "Keeping G proteins at bay: A complex between G protein-coupled receptor kinase 2 and G-beta-gamma," *Science* 300, 1256 (2003).

2. SAC MEMBERS FOCUS ON ALS UPGRADE, NEW DIRECTIONS

(Contact: Neville Smith, NVSmith@lbl.gov)

The Scientific Advisory Committee (SAC) met on December 16 - 17 with a full and exciting agenda. Neville Smith (ALS Division Deputy for Science) began the meeting with an update on ALS operations and productivity. David Robin (Accelerator Physics Group Leader) and Tony Warwick (Experimental Systems Group) spoke about the proposed ALS upgrade. John Kinney (LLNL) spoke about the new tomography beamline (8.3.2) and the wide range of interesting experiments that beamline will accommodate. Paul Alivisatos (UC Berkeley) spoke about the new beamline for high-pressure research (12.2.2). A large user community is anticipated for this beamline and groups, such as CALIPSO, have already been quite active in planning an array of experiments. Steve Leone (UC Berkeley) gave an update on work at the chemical dynamics beamline (9.0.2) and indicated the new directions the group will be taking in the future, such as creating more mobile endstations so that groups can use other beamlines along with 9.0.2 for their experiments. Closing out the first day of the meeting, John Spence (Arizona State Univ.) spoke about lensless imaging at Beamline 9.0.1. On December 17, the meeting continued with Miguel

Salmeron (Berkeley Lab) talking about the Molecular Foundry construction, proposal process, and an upcoming science workshop (for more information and registration particulars on the Molecular Foundry, go to <http://foundry.lbl.gov/workshops/workshop04.html>).

The meeting agenda concluded with talks by Ben Feinberg on radioactive-sample policy at the ALS, Zahid Hussain on the ALS Doctoral Fellowship Program (<http://www-als.lbl.gov/als/fellowships/index.html>), and by Yves Idzerda (chair of the Proposal Study Panel) on approved-program status (for more information on approved programs, go to <http://www-als.lbl.gov/als/uec/UserPolicy.html>). A close-out session followed with a brief summary given by the SAC chair, Sam Bader (Argonne). Current members of the advisory committee are listed online (go to <http://www-als.lbl.gov/als/ourorg/sac.html>).

3. FREE SXR/EUV LECTURES WEBCAST LIVE

(Contact: David Attwood, attwood@eecs.berkeley.edu)

"Soft X-Rays and Extreme Ultraviolet Radiation," a course being taught by David Atwood at UC Berkeley this spring, is being Webcast live over the Internet on Tuesdays and Thursdays from January 20 to May 14, 2004. Links to the webcasts, handouts, and homework problems can be found at <http://www.coe.berkeley.edu/AST/sxreuv>. The lectures begin at approximately 2:10 p.m. (Pacific time); completed lectures will be archived to allow for later viewing. The Webcasts are free, sponsored in part by the National Science Foundation.

The course will explore modern developments in the physics and applications of soft x rays and extreme ultraviolet radiation. Following a brief review of atomic physics and relevant absorption edges, the lectures consider electromagnetic radiation at short wavelengths, including dipole radiation, scattering, and refractive index using a semiclassical atomic model. Subject matter will include the generation of x rays with synchrotron radiation, laser-plasma sources, high harmonic generation, x-ray/EUV lasers, and black-body radiation. Concepts of spatial and temporal coherence will be described. Topics in x-ray optics will include total external reflection, multilayer coatings, zone plate (diffractive) lenses, interferometry, microscopes, and EUV telescopes. Applications will include high-resolution (20-nm) soft-x-ray microscopy with applications to the life and physical sciences, with elemental and chemical sensitivity. New results from three-dimensional imaging of biological samples using high-resolution nanotomography will be presented. EUV lithography for future 20-GHz nanoelectronic devices with features smaller than 20 nm will also be discussed.

4. UEC CORNER: NOTES FROM THE USERS' EXECUTIVE COMMITTEE

by Dennis Lindle

(Contact: Dennis Lindle, lindle@nevada.edu)

As incoming chair of the UEC, I would like to begin by expressing a hearty thank you to past chair Jennifer Doudna for a job well done in 2003--thanks Jennifer! The UEC also welcomes three new members in 2004: Clemens Heske, Corie Ralston, and Ed Westbrook. I look forward to working with them in the coming year. Finally, I would like to acknowledge the contributions of Gerry McDermott, especially as co-chair of the 2003 ALS Users' Meeting, who just completed his term on the UEC--thanks Gerry!

To begin, perhaps a brief introduction of the new chair is in order. I have been a synchrotron-radiation user since beginning my graduate studies in 1978, and I've been addicted ever since. Over the years, I have gotten my fix alternately at SSRL, NSLS, the SRC, and, of course, the ALS. I am a Professor of Chemistry at the University of Nevada, Las Vegas, and my primary research interests are in atomic and molecular spectroscopy. My group is a regular user of two-bunch mode, which we require for time-of-flight analysis of photoelectron energies, as well as multibunch operation,

and we work on several different beamlines at the ALS. Also, those of you who have been at the ALS for a while probably remember this is my second term as chair of the UEC; I was previously chair in 1991.

The UEC is looking forward to a busy year. We expect to be involved with issues such as the proposed ALS upgrades, planning the new user services building, and what we usually refer to as "quality of life" issues (housing, parking, etc.). As always, the UEC will take a leading role in organizing the 2004 ALS Users' Meeting. Please remember the UEC represents the entire user community at the ALS, and every one of us on the committee is eager to hear from you with any comments, concerns, or suggestions you might have about the ALS. The current membership can be found on the ALS web site. Please feel free to contact me or any of the other members of the UEC.

5. COMPENDIUM OF USER ABSTRACTS: TELL US WHAT YOU THINK (Contact: Lori Tamura, LSTamura@lbl.gov)

In the beginning, there was light. And the people wanted to know what the light was used for, and by whom. Thus, the ALS Compendium of User Abstracts was born. Ever since the ALS opened in 1993, it has collected and published a Compendium of the work performed here each year and distributed it to users, funding agencies, and other interested parties. Although the Compendium page is one of the most-visited pages on our Web site, this product also consumes a finite amount of (increasingly scarce) resources that might perhaps be put to better use elsewhere.

The ALS would like to hear from users: Do you use the Compendium? How valuable is it, in comparison to other communication products such as the Activity Report, ALSNews, beamline data sheets, science highlights, etc.? Would a scaled-back version (e.g., just an online database) be worthwhile? Perhaps it should be an ongoing, year-round activity instead of an annual compilation? Please send any ideas, comments, and suggestions you might have to Lori Tamura (LSTamura@lbl.gov).

6 ALSNEWS UNDERGOES TRANSFORMATION IN 2004 (Contact: Lori Tamura, LSTamura@lbl.gov)

Over the next few months, ALSNews will be undergoing some changes. Starting with this issue, ALSNews will be distributed once a month instead of biweekly. The Web version of the newsletter is also being redesigned to allow the inclusion of more graphics and to better reflect the design of the overall ALS site. In the future, look for an emailed HTML newsletter that incorporates graphics and links to more detailed information. As always, your feedback is welcome.

7. NANOSCIENCE BROCHURE NOW AVAILABLE ONLINE

The ALS recently published a brochure featuring the opportunities for nanoscience research at the ALS. A PDF version of the brochure (499 K) is now available online at http://www-als.lbl.gov/als/publications/nanoscience_brochure.pdf.

8. OPERATIONS UPDATE
(Contact: Ed Lampo, Lampo@lbl.gov)

For the user runs scheduled between December 10 and January 27, the beam reliability (time delivered/time scheduled) was 97%. Of the scheduled beam, 91% was delivered to completion without interruption. There were no significant outages.

Long-term and weekly operations schedules are available on the Web (<http://www-als.lbl.gov/als/schedules/index.html>). Requests for special operations use of the "scrubbing" shift should be sent to Jan Pusina (ALS-CR@lbl.gov, x4738) by 1:00 p.m. Friday. The Accelerator Status Hotline at (510) 486-6766 (ext. 6766 from Lab phones) features a recorded message giving up-to-date information on the operational status of the accelerator. A Web page showing the ring status in real time can be found at <http://www-als.lbl.gov/als/status/>.

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ALSNews is a monthly electronic newsletter to keep users informed about developments at the Advanced Light Source, a national user facility located at Ernest Orlando Lawrence Berkeley National Laboratory, University of California. The current and past issues of ALSNews are available on the World Wide Web. Point your browser to the following URL:

http://www-als.lbl.gov/als/als_news/

To subscribe, unsubscribe, or change your delivery address for the email version of ALSNews, send a message indicating your wishes and including your name and email address to alsnews@lbl.gov. We welcome suggestions for topics and content.

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1. BUCKYBALL MONOLAYER ELECTRONIC STRUCTURE

by Art Robinson

(Contacts: Wanli Yang, wlyang@lbl.gov; Z.-X. Shen, zxshen@stanford.edu)

The 1980s witnessed the discovery of fullerenes, whose novel properties have been intensively studied by experiment and theory but remain incompletely understood. Among the fullerenes, for example, the solid formed from C-60 molecules exhibits superconductivity at the relatively high temperature of about 40 K when doped with alkali metal atoms (only the high-Tc cuprate superconductors have higher transition temperatures). A Berkeley/Stanford/Italian collaboration working at the ALS has now reported angle-resolved photoemission measurements of C-60 (buckyball) monolayers doped with potassium. They were able to detect, for the first time, both the band structure and a Fermi surface, two classical electronic structure features that surprisingly survive in the presence of the strong interactions in this material.

Read the full story at http://www-als.lbl.gov/als/science/sci_archive/73buckyballs.html

Publication about this research: W.L. Yang, V. Brouet, X.J. Zhou, H.J. Choi, S.G. Louie, M.L. Cohen, S.A. Kellar, P.V. Bogdanov, A. Lanzara, A. Goldoni, F. Parmigiani, Z. Hussain, and Z.-X. Shen, "Band structure and Fermi surface of electron-doped C60 monolayers," *Science* 300, 303 (2003).

2. DANIEL CHEMLA RECOVERING FROM SURGERY

(Contact: Neville Smith, NVSmith@lbl.gov)

On December 15, ALS Director Daniel Chemla was admitted to the UC San Francisco hospital for surgery to remove an arteriovenous malformation in his cerebellum. The best prognosis at the time was that he would be in intensive care for four to five days and then be home for the holidays. However, because of the need for a second operation and other complications, he was not released from intensive care until January 6. On January 20, he was transferred to a rehab center in Berkeley, where he is slowly regaining his strength. There is a possibility that he will be home by the end of February. While we all look forward to his return to the ALS, it will not be for some time. In the meantime, his responsibilities are being shared by his three deputies, Ben Feinberg, Jim Krupnick, and Neville Smith, who are moving forward in implementing the agenda that Daniel has very clearly laid out for 2004.

3. ALS X-RAY MICROSCOPES SEE UP CLOSE

(Contacts: Weilun Chao, WLChao@lbl.gov; Tolek Tyliczszak, tolek@lbl.gov)

One of the promises of high brightness is the ability to do spatially resolved experiments (imaging, spectroscopy, and scattering). Two of the premier instruments in the world for these purposes are at the ALS: the veteran full-field transmission x-ray microscope (XM-1) on bend-magnet Beamline 6.1.2 and the new scanning transmission x-ray microscope (STXM) on undulator Beamline 11.0.2. Both instruments are based on Fresnel zone-plate lenses made at Berkeley Lab's Center for X-Ray Optics (CXRO), and they are regularly achieving spatial resolution better than 30 nm with the newest zone plates.

CXRO was featured in the Optical Society of America's "Optics in 2003" highlights for the clear demonstration of 20-nm spatial resolution, obtained with the soft x-ray microscope XM-1 at ALS Beamline 6.1.2. The measured resolution is the highest achieved with photon-based imaging optics." The highlight appeared in the December 2003 issue of Optics & Photonics News, published by the Optical Society of America (http://www.osa-opn.org/issue.cfm?issue_id=220). The microscope, designed and built by CXRO, operates at photon energies from 300 eV to 1800 eV (or wavelengths from 0.7 nm to 4 nm). It provides large elemental and magnetic sensitivity, penetration depths up to 10 micrometers, and in-situ imaging at cryogenic and elevated temperatures, in applied magnetic fields, and with applied electric currents. The microscope has a throughput of as many as 1,000 images a day. Research areas studied with the microscope include biology, environmental science, magnetism and electromigration. Tomographic reconstructions from images at multiple angles gives a three-dimensional imaging capability.

The original STXM on Beamline 7.0.1 at the ALS was always highly regarded for its potential. However, Beamline 7.0.1 is a multipurpose beamline and was not optimized for imaging, thus compromising the STXM's performance. Recently, a significantly upgraded version of the STXM was moved to a branch of the new Molecular Environmental Science (MES) Beamline 11.0.2 that was designed to match STXM operational requirements. The combination of an optimized beamline, improved scanning stability and placement accuracy, and an advanced zone plate from CXRO have enabled the STXM to realize the promised potential. Current Beamline 11.0.2 STXM parameters include a photon-energy range from 150 eV to 2000 eV, a flux up to 10^9 photons/s at a resolving power of 3000, a theoretical spot size of 30 nm, and a spatial resolution that has not yet been precisely characterized but is sufficient to see details in 25-nm patterns. In addition, an elliptically polarizing undulator (EPU) permits linear and circular dichroism studies with spatial resolution well below the 100-nm scale. A number of experiments on magnetic, environmental, and biological samples have been performed. There is a similar instrument (the polymer STXM) on bend-magnet Beamline 5.3.2.

4. UEC CORNER: NOTES FROM THE USERS' EXECUTIVE COMMITTEE

by Dennis Lindle

(Contact: Dennis Lindle, lindle@unlv.nevada.edu)

The first UEC meeting of 2004 is scheduled for March 2 in Room 6-2202 at 9:00 a.m. Topics will include updates on planned ALS upgrades and the proposed Users' Services Building, discussions of ALS strategic planning, organization of the 2004 ALS Users' Meeting, as well as continuing discussion of issues directly impacting users' interactions with the ALS and Berkeley Lab, such as housing and parking. As always, nearly all of the meeting will be open to anyone from the user community or the ALS—please join us if you can. If you have any suggestions or comments for the UEC or the ALS and cannot be there in person, please feel free to contact me or any of the other members of the UEC (please refer to the ALS web site). We would be especially interested to hear your thoughts about planned upgrades to the ALS (e.g., top-off mode) and to receive suggestions for this year's Users' Meeting.

5. ULTRAFAST X-RAY SCIENCE WORKSHOP COMING IN APRIL
(Contacts: Steve Leone, SRLeone@lbl.gov; John Corlett, JNCorlett@lbl.gov)

A workshop on ultrafast x-ray science will be held from April 28 to May 1, 2004, in San Diego, California. The goals of the workshop are to identify scientific highlights and directions for the use of x-ray techniques, to promote the cross-fertilization of ideas at the common forefront of the laser- and accelerator-based communities, and to define the source characteristics and ancillary equipment required for productive user facilities for ultrafast x-ray science. Students and those new to the field are specifically urged to attend to learn about this exciting field, which also includes breathtaking advances in the attosecond time domain. The registration deadline is March 22, 2004. For further information, go to the workshop Web site (<http://ultrafast2004.lbl.gov/>).

6. RELATED NEWS LINKS FROM AROUND THE WEB

Charles Shank to Step Down as Berkeley Lab Director
<http://www.lbl.gov/publicinfo/press-release-2-09-2004.html>

Department of Energy Announces Extension and Competition Decisions for Laboratory Contracts
http://www.energy.gov/engine/content.do?PUBLIC_ID=14847&BT_CODE=PR_PRESSRELEASES&TT_CODE=PRESSRELEASE

U.S. Department of Energy's Office of Science Unveils 20-Year Vision for the Future of Basic Research
http://www.energy.gov/engine/content.do?PUBLIC_ID=14920&BT_CODE=PR_PRESSRELEASES&TT_CODE=PRESSRELEASE

Groundbreaking Marks Berkeley Lab's Leap into Nano-Revolution
<http://www.lbl.gov/Science-Articles/Archive/Lab-Foundry-groundbreaking.html>

Nanotechnology Gets Boost from National Science Foundation
<http://news-service.stanford.edu/news/2004/january14/nnin-114.html>

A Catalyst for Peace and Scientific Development
<http://www.mercurynews.com/mld/mercurynews/8014005.htm>

Elves Make Protein Crystallography Easier
http://www.berkeley.edu/news/media/releases/2004/01/26_elves.shtml

7. OPERATIONS UPDATE

(Contact: Ed Lampo, Lampo@lbl.gov)

For the user runs scheduled between January 27 and February 23, the beam reliability (time delivered/time scheduled) was 98%. Of the scheduled beam, 94% was delivered to completion without interruption. There were no significant outages.

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http://www-als.lbl.gov/als/als_news/

To subscribe, unsubscribe, or change your delivery address for the email version of ALSNews, send a message indicating your wishes and including your name and email address to alsnews@lbl.gov. We welcome suggestions for topics and content.

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1. NANODIAMONDS SHOW BUCKYBALL SURFACE

by Lori Tamura

(Contact: Lou Terminello, terminello@llnl.gov)

If you blast a diamond into (nanosized) smithereens you will get... buckyball fragments? In fact, scientists from Lawrence Livermore National Laboratory have found that diamonds made up of up to a few hundred carbon atoms do not exhibit the smooth, faceted surfaces commonly associated with crystals. Instead, at this scale, portions of the diamond's surface will spontaneously buckle into the curved, geodesic-dome structure found in buckyballs. The researchers came to this surprising conclusion after performing ab initio calculations as well as x-ray absorption and emission experiments on nanodiamonds synthesized in detonation waves from high explosives. The discovery of this new family of carbon clusters, dubbed "bucky diamonds," may have implications for a wide range of areas, from astronomy, where diamonds are studied as a constituent of meteorites and interplanetary dust, to optoelectronics, where nanodiamonds might be used as photonic switches and tunable lasers.

Read the full story at http://www-als.lbl.gov/als/science/sci_archive/72buckydiamond.html

Publication about this research: J.-Y. Raty, G. Galli, C. Bostedt, T.W. van Buuren, and L.J. Terminello, "Quantum Confinement and Fullerenelike Surface Reconstructions in Nanodiamonds," *Phys. Rev. Lett.* 90, 037401 (2003).

2. DEMONSTRATION OF COHERENT X-RAY DIFFRACTION IMAGING

by Art Robinson

(Contact: Stefano Marchesini, marchesini@llnl.gov)

In order to image the interiors of intrinsically noncrystalline objects with nanometer resolution, several groups have been developing the technique of coherent x-ray diffraction (or lensless) imaging; however, up until now they have required the use of additional image information to supplement the diffraction pattern. At the ALS, a collaboration comprising researchers from Lawrence Livermore National Laboratory, Arizona State University, and the ALS has demonstrated the ability to make two-dimensional images of clusters of gold balls 50 nm in diameter from diffraction data alone with a resolution of 20 nm.

Read the full story at http://www-als.lbl.gov/als/science/sci_archive/74lensless_imaging.html

Publication about this research: S. Marchesini, H. He, H.N. Chapman, S.P. Hau-Riege, A. Noy, M. R. Howells, U. Weierstall, and J.C.H. Spence, "X-ray image reconstruction from a diffraction pattern alone," Phys. Rev. B 68, 140101(R) (2003).

3. DESIGNING A NOVEL GLOBULAR PROTEIN FOLD

by Art Robinson

(Contact: David Baker, dabaker@u.washington.edu)

A major challenge of computational structural biology has been to create, from scratch, new proteins with heretofore unobserved three-dimensional structures. A collaboration from the University of Washington, Seattle, the University of North Carolina, Chapel Hill, and the Fred Hutchinson Cancer Research Center has now developed and demonstrated a methodology for protein-structure prediction and design by creating the first artificial globular protein with a novel topology, a 93-residue protein called Top7. Significantly, the x-ray structure of Top7 agreed almost precisely with the structure specified by the computational model.

Read the full story at http://www-als.lbl.gov/als/science/sci_archive/76globular_protein.html

Publication about this research: B. Kuhlman, G. Dantas, G.C. Ireton, G. Varani, B.L. Stoddard, and David Baker, "Design of a novel globular protein fold with atomic-level accuracy, " Science 302, 1364 (2003).

4. NEW X-RAY MICROSCOPE RECEIVES FUNDING

(Contact: Carolyn Larabell, CALarabell@lbl.gov)

Researchers with Berkeley Lab and the University of California at San Francisco have received \$2.5 million in grants to build a new x-ray microscope at the ALS. Users Carolyn Larabell and Mark Le Gros (both of Berkeley Lab) are the principal investigators. The first-of-its-kind microscope holds forth the promise of "cat scans" for biological cells and other unprecedented capabilities for cell and molecular biology studies. It also promises a better understanding of human diseases at the molecular level and possibly new discoveries for treating those diseases. Carolyn and Mark have been using XM-1, an existing x-ray microscope at Beamline 6.1.2, to demonstrate the potential of using this technology in cell and molecular biology studies. XM-1 was designed and is operated by the Center for X-Ray Optics primarily for the study of materials. The new microscope, dubbed XM-2, will be optimized for biology and will therefore have several advantages, including improved zone plates, the optic devices composed of nanometer-scale concentric metal rings that are used to focus x-rays for imaging purposes.

Read the full story at <http://www.lbl.gov/Science-Articles/Archive/ALS-x-ray-microscopy.html>

5. UEC CORNER: NOTES FROM THE USERS' EXECUTIVE COMMITTEE

by Dennis Lindle

(Contact: Dennis Lindle, lindle@nevada.edu)

The UEC met for the first time this year on March 2. For the uninitiated, a typical UEC meeting is an all-day affair during which we hear updates from the ALS administration and staff on user and facility issues running the gamut from big-picture topics (e.g. strategic planning, upgrading the ALS) to more focused, quality-of-life concerns (e.g. housing, parking). Aside from its primary role in advising the ALS leadership on behalf of the user community, the UEC is also responsible for planning the annual Users' Meeting, which will be held October 18 - 20 this year.

At our March 2 meeting, we discussed three topics of broader interest to the user community. (1) ALS Upgrades. The highest priority is to modify the ALS to operate in "top-off" mode, in which the ring current would be maintained at a near-constant 500 mA by small injections at brief intervals (seconds to minutes). The Accelerator Physics Group is currently working with beamline scientists and users to assess the impact of injecting electrons with beam available (an essential aspect of "top-off" mode) on various experiments around the ring. Operation in "top-off" mode is expected to begin in about three years. (2) Strategic Planning. Another high priority for the ALS is upgrading existing insertion devices and beamlines to take advantage of new scientific opportunities and technological advances. To optimally achieve this in a systematic fashion, the ALS has begun a strategic-planning exercise that will culminate in a DOE-sponsored review of the ALS about a year from now. ALS staff are in the midst of a series of retreats looking ahead 5 - 10 years in order to identify key opportunities. As part of this process, in about two months, there will be a joint ALS/UEC retreat to obtain users' perspectives. If you have recommendations for future scientific or technological developments at the ALS, please feel free to contact me or another member of the UEC. (3) User Support Building. This new building, which will replace Building 10 adjacent to the ALS, will address numerous space needs of the user community, including high-bay staging and more office space. Unfortunately, the expected start date for this project (FY 2005) has been delayed two years due to funding difficulties. The UEC is clearly disappointed with the delay, but we are committed to working with ALS and Berkeley Lab management, who are very supportive of the project, to minimize its time to completion. Please stay tuned for more news as these issues continue to unfold.

6. APPLY NOW FOR 2004-2005 DOCTORAL FELLOWSHIPS (Contact: Zahid Hussain, ZHussain@lbl.gov)

The ALS is offering several doctoral fellowships in residence for the 2004-2005 academic year. Through these fellowships, qualified graduate students will gain hands-on experience in the use of synchrotron radiation by performing a major part of their thesis work at the ALS. Applicants must be full-time Ph.D. students pursuing synchrotron-radiation-based research in the physical or biological sciences and have passed all qualifying or comprehensive verbal and written examinations. Individuals from underrepresented groups are encouraged to apply. The deadline for applying is May 1, 2004.

The fellowships include a one-year appointment (with the possibility of renewal) and a \$16,000 annual stipend. Fellows will be matched with an on-site mentor (generally a beamline scientist) and have access to ALS resources, including beam time. Fellows are expected to present their results at a meeting or a seminar at the end of the fellowship year.

Read more about it at <http://www-als.lbl.gov/als/fellowships/>

7. MEZZANINE CONSTRUCTION COMPLETED, SHUTDOWN PLANS SET (Contact: Steve Rossi, SLRossi@lbl.gov)

Construction of the office build-out in the ALS mezzanine has been completed. Scientific Support Group members began moving into their new home in late March. The mezzanine is now completely built out with the exception of one space, which has already been designated as the future home the Chemical Dynamics Group's laser lab.

Planning for this year's shutdown is well underway and it is shaping up to be a very busy time. The ALS will shut down on April 26 for maintenance and installation. Following a brief beamline commissioning period, the ALS will reopen for user operations on June 10. Major work to be accomplished during the shutdown includes a complete survey and alignment of the storage ring,

the replacement of the W16 wiggler in Sector 5 with a W11 insertion device (for a planned femtosecond beamline), replacement of the superbend cold heads, and installation of higher-order-mode dampers on third-harmonic cavities 1, 2, and 3.

We plan to take advantage of the long shutdown period to accomplish two facility projects as well. To accommodate the increased usage of liquid nitrogen at the ALS, a new and larger bulk storage tank will be installed. The old 2300-gallon tank will be replaced with a 6000-gallon tank. The increased size of the tank also necessitates a new foundation. A building column in Sector 4 will also be removed to make way for the new meV-resolution beamline (MERLIN).

8. PUBLICATIONS NEEDED BY APRIL 9 FOR INCLUSION IN ACTIVITY REPORT (Contact: alsuser@lbl.gov)

If you have recently published any ALS-related work in a scientific journal, conference proceedings, or book chapter; completed a Ph.D. thesis; or received a patent based on work done at the ALS, please let us know by April 9 so that your work can be reported to the DOE as well as cited in the 2003 ALS Activity Report.

Simply go to the User Services Online Forms Web page at <http://alsusweb.lbl.gov/>. This works best if you use Netscape 6 or 7 or Microsoft Internet Explorer 5.0 or greater; otherwise, you will lose data if you hit the "Back" key. Be sure to first use the "Search for Publications" option, to see if your publications have been previously entered into our database by a collaborator. If you are one of our more prolific publishers or have a common last name, you can limit the search by initials, beamline, year published, or journal name. Then, please use the "Submit Publication Listings" option and enter the information requested. Most of the mandatory fields are required by DOE. The most important fields are "Title" and "Journal or Publication Name." If you don't know something, such as the specific page, or month published, please type n/a in the field. We'll attempt to track it down.

Your timely response will be greatly appreciated, as it is imperative that we accurately report the number of ALS-related publications to the DOE and that we include them in our annual Activity Report. Remember, if it's on your CV, and all or part of the work was done at the ALS, it should be in our database!

9. OPERATIONS UPDATE (Contact: Ed Lampo, Lampo@lbl.gov)

For the user runs scheduled between February 24 and March 28, the beam reliability (time delivered/time scheduled) was 92%. Of the scheduled beam, 86% was delivered to completion without interruption. There was a significant loss of time due to failure of some feedthroughs, which resulted in leaks in the vacuum. This occurred during the first week of two-bunch operation.

Long-term and weekly operations schedules are available on the Web at <http://www-als.lbl.gov/als/schedules/index.html>. Requests for special operations use of the "scrubbing" shift should be sent to Jan Pusina (ALS-CR@lbl.gov, x4738) by 1:00 p.m. Friday. The Accelerator Status Hotline at (510) 486-6766 (ext. 6766 from Lab phones) features a recorded message giving up-to-date information on the operational status of the accelerator. A Web page showing the ring status in real time can be found at <http://www-als.lbl.gov/als/status/>.

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To subscribe, unsubscribe, or change your delivery address for the email version of ALSNews, send a message indicating your wishes and including your name and email address to alsnews@lbl.gov. We welcome suggestions for topics and content.

LBNL/PUB-889

Editors: lstamura@lbl.gov, alrobinson@lbl.gov, ejmoxon@lbl.gov

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1. STRUCTURE OF TELOMERE-PROTECTING PROTEINS

by Art Robinson

(Contact: Thomas Cech, thomas.cech@colorado.edu)

Telomeres are specialized protein–DNA complexes that cap the ends of linear chromosomes in eukaryotic cells. Recent discoveries in organisms from yeasts to humans have shown that Pot1 (protection of telomeres) proteins are involved in the chromosome capping, but the molecular mechanism for the binding between Pot1 and DNA remained unknown. A group from the University of Colorado at Boulder and the Stowers Institute for Medical Research has now obtained high-resolution x-ray crystallography structures of complexes comprising a DNA-binding domain of Pot1 and sections of DNA in yeast that explain the binding specificity.

Read the full story at

http://www-als.lbl.gov/als/science/sci_archive/77telomere.html

Publication about this research: M. Lei, E.R. Podell, P. Baumann, and T.R. Cech, "DNA self-recognition in the structure of Pot1 bound to telomeric single-stranded DNA," *Nature* 426, 198 (2003).

2. PINNING DOWN EXCHANGE BIAS

by Art Robinson

(Contact: Hendrik Ohldag, HOldag@lbl.gov)

Exchange bias refers to a preferred direction of magnetization of a ferromagnet in contact with an antiferromagnet. It is due to a shift in the hysteresis loop (magnetization vs. external magnetic field) when cooling the sample in an external field (field-cooling) to below the antiferromagnet's ordering (Neel) temperature. Magnetic devices based on exchange bias are of considerable commercial importance for data storage, but the mechanism behind it has evaded detection for 50 years. A collaboration from the Stanford Synchrotron Radiation Laboratory, the ALS, the Swiss Light Source, and Hitachi Global Storage Technologies has now shown that a relatively small number of "pinned" spins in the interface layer of the antiferromagnet are the cause.

Read the full story at

http://www-als.lbl.gov/als/science/sci_archive/78exchange_bias.html

Publication about this research: H. Ohldag, A. Scholl, F. Nolting, E. Arenholz, S. Maat, A.T. Young, M. Carey, and J. Stohr, "Correlation between exchange bias and pinned interfacial spins," Phys. Rev. Lett. 91, 017203 (2003).

3. ROBOTS SCORE BIG WITH PROTEIN CRYSTALLOGRAPHERS (Contact: Lynn Yarris, LCYarris@lbl.gov)

A big step towards speeding up the process of solving protein structures has been achieved by researchers with Berkeley Lab who have developed and successfully demonstrated the first automated system for mounting and aligning protein crystals in an x-ray beamline at a synchrotron light source.

With genome sequencing becoming almost a conveyer-belt process, one of the next big challenges in biology is to determine the structures of the proteins being assembled by all those genomes. In the architecturally loopy, twisted world of proteins, knowing structural form is a key to understanding molecular and cellular function. As there may be more than 30,000 different kinds of human proteins, and nearly a trillion different kinds of proteins on Earth, solving protein structures is another process that screams out for automation.

Read the full story at
<http://www.lbl.gov/Science-Articles/Archive/PBD-robot-crystallography.html>

4. USERS' MEETING: MARK YOUR CALENDARS, SEND WORKSHOP IDEAS (Contact: Corie Ralston, CYRalston@lbl.gov)

Preparations have begun for this year's Users' Meeting, which will be held October 18-20 at the ALS--mark your calendars early and make plans to attend! Since last year's meeting commemorated the 10th anniversary of ALS operations, this year's theme will be "Looking Forward" to the future. Workshops will again be an integral part of the meeting program: many of the successful programs and technologies of tomorrow will have their origins in the workshops of today. As the ALS begins planning for the next 5 to 10 years, users can help define the path forward by proposing workshop ideas.

To this end, the Users' Meeting planning committee, chaired by Corie Ralston and Keith Jackson, is interested in hearing from the user community what workshops they would like to see offered. Workshops can range in scope from basic scientific explanation to in-depth exploration of highly specialized topics. Examples already on the program include a workshop on microscopy organized by Carolyn Larabell and a workshop on the Molecular Foundry chaired by Wayne Mitchell. If you have a suggestion for a workshop, please contact Corie Ralston (CYRalston@lbl.gov). Hope to see you in October!

5. UEC CORNER: NOTES FROM THE USERS' EXECUTIVE COMMITTEE by Dennis Lindle (Contact: Dennis Lindle, lindle@unlv.nevada.edu)

On February 2, the President submitted his Fiscal Year 2005 (FY05) budget request to Congress. As you've probably heard, the request cuts the DOE Office of Science budget by 2% from the FY04 budget (from \$3.5 to \$3.43 billion). I am working in close collaboration with the leadership of the users' groups of other facilities on strategies for responding to the President's proposed science budget. If you would like to learn more about how you can

participate, a Web page sponsored by the American Physical Society is available for further information:

http://www.aps.org/public_affairs/issues/budget/als.cfm

6. PROPOSAL SCORES AND RUNNING SCHEDULE AVAILABLE ONLINE

(Contact: Gary Krebs, GFKrebs@lbl.gov)

The general sciences beam time allocation process for the running period from June through December 2004 is complete. The number of proposals for the cycle was 230, up from 213 in the previous period. This running period will last seven months, but the next running periods will all be 6 months in duration: January-June and July-December. The number of eight-hour shift requests for the upcoming cycle was 4549. A total of 2508 shifts, equal to about 55% of the total time requested in the proposals, was allocated. Competition for beam time on insertion-device beamlines was especially keen--requests for the insertion device beamlines will continue to find the proposal process for general users competitive; approximately 42% of the requested beam time was allocated. For more detailed results, including beamline score distributions and cutoff scores, go to <http://www-als.lbl.gov/als/quickguide/pspcores.html> .

The schedule for the upcoming running period has also been posted on the Web at http://www-als.lbl.gov/als/schedules/next_tsch.html . Two-bunch operation will occur August 11-22.

7. ALS BEGINS SHUTDOWN THIS WEEK

(Contact: Steve Rossi, SLRossi@lbl.gov)

The ALS shut down at 8:00 A.M. on Monday, April 26, for planned installations and maintenance. User operations will resume at 8:00 A.M. on Thursday, June 10. One of the first projects tackled during the shutdown was the replacement of the 2300-gallon liquid nitrogen tank with a 6000-gallon tank to accommodate the increased usage of liquid nitrogen at the ALS. The old tank was removed on Monday. Other projects scheduled include realignment of the storage ring, replacement of the W16 wiggler in Sector 5 with a W11 insertion device, and replacement of the superbend cold heads.

In the realignment process, surveyors and engineers will carefully measure the position of each sector arc in the storage ring, calculate their optimal positions, move each arc girder as necessary to bring the ring back to its nominal circumference and alignment, reposition the insertion devices to minimize stresses on the flex bands, and finish by reconfirming the position of each component. Beamlines may see a shift in the source position as a result of these moves. To ensure proper operation of the beamlines following the storage ring realignment, 10 shifts of beam time have been set aside at the end of the shutdown for testing and alignment. Responsible scientists for each beamline are being contacted separately and should make plans to ensure that their beamlines are functioning properly with the aid of ALS scientific and support staff.

8. OPERATIONS UPDATE
(Contact: Ed Lampo, Lampo@lbl.gov)

For the user runs scheduled between March 30 and April 25, the beam reliability (time delivered/time scheduled) was 96%. Of the scheduled beam, 85% was delivered to completion without interruption. Delays in start up and water interlock problems accounted for most of the outage time.

Long-term and weekly operations schedules are available on the Web at <http://www-als.lbl.gov/als/schedules/index.html> . Requests for special operations use of the "scrubbing" shift should be sent to Jan Pusina (ALS-CR@lbl.gov, x4738) by 1:00 p.m. Friday. The Accelerator Status Hotline at (510) 486-6766 (ext. 6766 from Lab phones) features a recorded message giving up-to-date information on the operational status of the accelerator. A Web page showing the ring status in real time can be found at <http://www-als.lbl.gov/als/status/> .

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Editors: lstamura@lbl.gov, alrobinson@lbl.gov

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1. JANOS KIRZ APPOINTED ACTING ALS DIVISION DIRECTOR

Highly regarded physicist and x-ray microscopist Janos Kirz of Stony Brook University has been named by Berkeley Lab Director Charles Shank to serve as Acting Director of the ALS while Director Daniel Chemla continues on medical leave. The announcement was made to ALS staff on May 6, and the appointment will go into effect on June 1.

Dr. Kirz received both his B.A. and Ph.D. degrees from the University of California, Berkeley. From 1964-67, he also did graduate work at Berkeley Lab in the Alvarez group using the 72-inch bubble chamber at the Lab's old Bevatron facility. Most recently, in 2003, Dr. Kirz spent a 10-month sabbatical here setting up a soft x-ray diffraction imaging research program at Beamline 9.0.1 (see ALSNews Vol. 216 at http://www-als.lbl.gov/als/als_news/news_archive/vol.216_021903.html).

"We are very fortunate to have someone of the reputation and accomplishment of Dr. Kirz step into this important assignment," said Director Shank in his announcement. The full text of the Director's announcement can be read at <http://www.lbl.gov/today/2004/May/07-Fri/kirz-jump.html> .

2. QUASI-1D METAL SHOWS UNUSUAL SPECTRAL BEHAVIOR

by Lori Tamura

(Contact: Joerg Schaefer, Joerg.Schaefer@Physik.Uni-Augsburg.DE)

One-dimensional (1D) systems can be approximated by ultrathin wires or crystals with unidirectional bonds that confine electron motion to one dimension. At low temperatures, some 1D systems undergo a phase transition where interactions between the lattice and the electrons create a charge-density wave (CDW) in the material, which then exhibits highly nonlinear electrical behavior. An ideal CDW conductor will show an energy gap in its electronic energy bands, resulting in reduced conductivity. In real materials that are not perfectly 1D, the gapping may be incomplete, with portions of the electron bands remaining metallic. Such phenomena are particularly accessible with angle-resolved photoemission spectroscopy (ARPES). A group of researchers from Germany and the U.S. performed a photoemission study at the ALS of a quasi-1D metal, providing the first direct spectroscopic observation at low temperature of the electronic structure of the CDW system, niobium triselenide (NbSe₃).

Read the full story at

http://www-als.lbl.gov/als/science/sci_archive/75quasi1Dmetal.html

Publication about this research: J. Schaefer, M. Sing, R. Claessen, E. Rotenberg, X.J. Zhou, R.E. Thorne, S.D. Kevan, "Unusual Spectral Behavior of Charge-Density Waves with Imperfect Nesting in a Quasi-One-Dimensional Metal," Phys. Rev. Lett. 91, 066401 (2003).

3. USERS INVITED TO SEND STRATEGIC PLANNING INPUT (Contact: Neville Smith, NVSmith@lbl.gov)

As part of an ALS 10-year strategic planning exercise, the ALS and UEC will be meeting in Berkeley on June 9-10. ALS management would like to invite the user community to send input regarding strategic directions for the ALS to Neville Smith (NVSmith@lbl.gov). Earlier this year, during the first phase of this strategic exercise, ALS management heard from beamline scientists their views on the future of their fields and the resources that will be needed for the scientific programs. The upcoming ALS/UEC meeting will be the second phase of this process, as was reported by UEC Chair Dennis Lindle in ALSNews Vol. 239 (http://www-als.lbl.gov/als/als_news/news_archive/vol.239_033104.html). Note that the workshops at this year's Users' Meeting (see UEC Corner, below) will also provide input into the ALS strategic plan, which will be presented to the Department of Energy's Office of Basic Energy Sciences in a review tentatively scheduled for late January 2005.

4. CALL FOR GENERAL SCIENCES PROPOSALS: DUE JULY 7 (Contact: alsproposals@lbl.gov)

The User Services Office is now accepting general user proposals from scientists who wish to conduct research in the general sciences at the ALS during the running period from January through June 2005. The deadline for submissions is Wednesday, July 7, 2004. Note that the ALS has slightly altered its running periods to better coincide with the calendar year. Beginning in 2005, cycles will run from January through June and July through December.

In response to user requests, ALS User Services has added features to the general sciences proposal form. Users can now save a partially filled proposal for later completion; proposals can be edited an unlimited number of times before final submission. Enhanced page navigation options are also available in the new and improved proposal form. See the ALS online forms link below for more information.

Scientists wishing to renew a previous proposal must download the short "ALS Experiment Report and Request for Beamtime" form (see links below) and submit it to the User Services Office by the July 7 deadline. The form can be saved to your hard disk, filled out, and attached in an email message to alsproposals@lbl.gov with the key words "Experiment Report" in the subject header. Proposals cannot be renewed for more than three cycles after they are first submitted. After three rollover cycles, a new proposal must be submitted. If your proposal is designated ALS-00980 or lower, then you must submit a new proposal to be eligible for beamtime.

The numeric rating for each proposal will be communicated to the user along with any comments that might have been added by the Proposal Study Panel. The cutoff rating for each beamline in the previous proposal cycle is published on the Web. The following resources are available for further information:

ALS User Services Administrator
alsuser@lbl.gov

General user proposal process

<http://www-als.lbl.gov/als/quickguide/independinvest.html>

ALS online forms

<http://alsusweb.lbl.gov/>

ALS Experiment Report and Request for Beamtime

http://www-als.lbl.gov/als/quickguide/experiment_report.doc

Beamline information

http://www-als.lbl.gov/als/als_users_bl/bl_table.html

Proposal Study Panel (PSP) scores

<http://www-als.lbl.gov/als/quickguide/pspscores.html>

5. UEC CORNER: NOTES FROM THE USERS' EXECUTIVE COMMITTEE

by Dennis Lindle

(Contact: Dennis Lindle, lindle@unlv.nevada.edu)

This year's Annual Users' Meeting is scheduled to begin on October 18 and is co-chaired by UEC members Corie Ralston and Keith Jackson. After last year's celebration of the ten-year anniversary of the ALS, this year we plan to focus on the future of the facility. Part of this crystal-ball gazing will be done with a full slate of workshops covering a wide range of topics. At this time, we expect workshops on the following topics in conjunction with the Users' Meeting (organizers listed in parentheses):

Basic Science of Synchrotron Facilities
(David Robin)

New Directions in Hard X-Ray Spectroscopy and Spectromicroscopy
(Matthew Marcus)

Photon-In and Photon-Out X-Ray Spectroscopy in
Nano Material Sciences and Chemical-Biological Analysis
(Jonathan Denlinger and Jinghua Guo)

Advances in Crystallographic Data Analysis and Acquisition
(Christine Trame)

X-Ray Microscopy: Advances and Challenges
(Carolyn Larabell)

Nanoscience at Synchrotrons
(Lou Terminello)

Strongly Correlated Electron Systems
(Byron Freelon)

More information on these workshops, as well as the Users' Meeting, will be forthcoming in the near future. I hope to see you all there!

I am pleased to announce that the User Services Office has been working in cooperation with the Berkeley Lab Site Access Office to provide a means for student experimenters who only visit the

ALS occasionally to have access to the Lab by car (i.e., parking!) during regular working hours. Permission can be requested on a case-by-case basis. Interested users are encouraged to contact the User Services Office (alsparking@lbl.gov, 510-486-7745) for more details.

6. DEADLINE FOR DOCTORAL FELLOWSHIPS EXTENDED TO JUNE 1 (Contact: Zahid Hussain, ZHussain@lbl.gov)

The application deadline for ALS doctoral fellowships in residence for the 2004-2005 academic year has been extended to June 1. Through these fellowships, qualified graduate students will gain hands-on experience in the use of synchrotron radiation by performing a major part of their thesis work at the ALS. Applicants must be full-time Ph.D. students pursuing synchrotron-radiation-based research in the physical or biological sciences and have passed all qualifying or comprehensive verbal and written examinations. Individuals from underrepresented groups are encouraged to apply. Read more about it at <http://www-als.lbl.gov/als/fellowships/>.

7. ALS USERS' MEETING DESIGN CONTEST (Contact: Liz Moxon, EJMoxon@lbl.gov)

Everyone is invited to enter the new and improved ALS Users' Meeting Design Contest. This year's contest is new because the winning design will be featured for the first time on the front of a cotton baseball hat, and improved because one size fits all so we won't run out of anyone's size this year! So take a minute from your busy day and come up with a design--rough drawings, concepts, and polished artwork are all acceptable--that includes the words "Advanced Light Source" or "ALS" and submit it by Friday, June 18 to

Elizabeth Moxon
Berkeley Lab, MS 4R0230
Berkeley, CA 94720-8235
Email: ejmoxon@lbl.gov
Fax: (510) 495-2111

Please note: The area for artwork on the front of the cap is 4 in. x 2.5 in. (10 cm x 6.25 cm), so highly detailed images or photographs may be difficult to reproduce.

8. SHUTDOWN PROCEEDING ON SCHEDULE (Contact: Steve Rossi, SLRossi@lbl.gov)

As we enter the final week of the maintenance and installation portion of the shutdown, staff are working diligently to wrap up all work in order to hand over the ALS to the Accelerator Physics Group to begin the start-up procedure/process.

Major tasks undertaken during the shutdown such as the survey and realignment of the storage ring, replacement of the W16 wiggler in Sector 5 with a W11 insertion device, and replacement of the superbend cold heads are now in their final stages.

9. OPERATIONS UPDATE
(Contact: Ed Lampo, Lampo@lbl.gov)

The ALS shut down at 8:00 A.M. on Monday, April 26, 2004, for planned installations and maintenance. User operations will resume at 8:00 A.M. on Thursday, June 10, 2004.

Long-term and weekly operations schedules are available on the Web at <http://www-als.lbl.gov/als/schedules/index.html> . Requests for special operations use of the "scrubbing" shift should be sent to Jan Pusina (ALS-CR@lbl.gov, x4738) by 1:00 p.m. Friday. The Accelerator Status Hotline at (510) 486-6766 (ext. 6766 from Lab phones) features a recorded message giving up-to-date information on the operational status of the accelerator. A Web page showing the ring status in real time can be found at <http://www-als.lbl.gov/als/status/> .

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Online version with photos at http://www-als.lbl.gov/als/als_news/

1. MESSAGE FROM THE ACTING DIRECTOR

by Janos Kirz

(Contact: Janos Kirz, JKirz@lbl.gov)

I have been sitting at Daniel's desk for almost four weeks now. This may be a good time to share some impressions. I am thoroughly impressed by the talent, the dedication, the professionalism, and the team spirit of the ALS staff at every level. This level of excellence is no accident. It is the result of the vision and leadership that Daniel brought to the organization, and the care with which he built the team to run it. I was delighted that last week Daniel came to the annual ALS picnic. His condition is improving, and it is certainly my hope that he will be back at his desk in the not too distant future.

The ALS continues on its path of vigorous development. The number of users, as well as the number of operating beamlines continues to grow, and projects for future facilities are moving forward at a rapid pace. I am particularly pleased that Carolyn Larabell received a major new NIH grant to develop a Biomedical Technology Resource Center at the ALS, centered around XM-2, a new microscope designed for high-resolution tomography. Planning for top-off operation is proceeding, with support from DOE/BES. There is a strong effort to bring about the construction of the much needed user hostel, with projected occupancy two years from now.

My assignment for the near future is to develop a strategic plan for the ALS. The plan put together by Daniel nearly five years ago is well on its way to being realized, and we need to decide on the next phase. Neville has already organized retreats with the UEC and with ALS scientific staff to seek input and invited your input through a note in the last issue of ALSNews. I want to reiterate this invitation--if you have not expressed your views before, please do so now. More generally--if there is anything I can do to make your work at the ALS more productive, please do let me know. The mission of the ALS is to facilitate outstanding science, and we are here to carry out that mission.

2. UEC CORNER: ALS/UEC STRATEGIC PLANNING RETREAT

by Dennis Lindle

(Contact: Dennis Lindle, lindle@unlv.nevada.edu)

As Janos alluded to above, a joint ALS/UEC strategic-planning retreat was held June 9 - 10. The approximately 45 attendees included many of the ALS senior and scientific staff, past and present UEC members, and other users representing their respective research communities. In organizing

the retreat, Neville and I asked presenters to (1) describe the current frontiers of their field; (2) imagine where their field will be in 5 - 10 years; and (3) suggest what new tools will be needed for the ALS to remain competitive. We weren't disappointed! Not only did we hear excellent overviews of the many fields using the ALS, but numerous suggestions were provided for both evolutionary and revolutionary enhancements of ALS capabilities. Now the hard part begins: prioritizing these many suggestions into a coherent strategic plan. To continue to engage users in this process, I recommended that the ALS and UEC jointly identify several small working groups to analyze suggestions in their fields of expertise. In the longer term, we also plan to use the workshops scheduled during the Annual Users' Meeting in October as an opportunity to describe some of these new ideas to the users who would benefit from them. Finally, I would like to second Janos's invitation for users to express their views on the strategic-planning process, either through the UEC or directly to the ALS. The ALS management is intent on hearing about user needs--your opinion does count!

3. NOBEL LAUREATE STEVEN CHU NAMED BERKELEY LAB DIRECTOR

The University of California (UC) Board of Regents announced on June 17 that Steven Chu, co-winner of the 1997 Nobel Prize in physics, will be the sixth director of Berkeley Lab. Chu's appointment will take effect August 1, replacing departing director Charles V. Shank. Chu earned his doctorate from UC Berkeley and is currently the Theodore and Francis Geballe Professor of Physics and Applied Physics at Stanford. In 1997, Chu was awarded the Nobel Prize in physics with Claude Cohen-Tannoudji and William D. Phillips "for development of methods to cool and trap atoms with laser light." Beginning in 1989, Chu expanded his research scope to include polymer physics and biophysics at the single-molecule level. "Steve Chu brings to this position outstanding leadership qualities and a record of superior achievement in science," said UC President Robert C. Dynes. "His combination of skills is precisely what we need to keep the Lawrence Berkeley National Laboratory at the forefront of scientific excellence and to guide the lab wisely through the upcoming potential contract competition."

Read the full story at <http://www.ucop.edu/news/archives/2004/jun17.htm> .

4. SAM BADER GIVES COLLOQUIUM ON NANOMAGNETISM

Sam Bader, a senior physicist and group leader at Argonne National Laboratory, gave a colloquium on "Opportunities in Nanomagnetism" to a packed roomful of ALS staff and students on June 17. Bader is a co-editor of "Magnetism Beyond 2000," a broad survey of the most significant recent and ongoing scientific and technological developments in magnetism. He has co-authored over 290 publications and appears in the ISI 1981 - 97 "most cited physicists" listing. Bader, a graduate of UC Berkeley and chair of the ALS Scientific Advisory Committee, was in town for the SAC meeting this month and agreed to stay an extra day to give the colloquium.

Bader began his presentation with some historical perspectives, acknowledging the long history of the science of magnetism. He credits William Gilbert with writing the first real textbook that embraced the scientific method, "De Magnete," ca. 1600. To demonstrate how far we've come since then, Bader showed a woodcut illustration of geomagnetism from that work (a circle with arrows in it) and juxtaposed it with a 2002 representation of a magnetic vortex structure (also a circle with arrows in it). The difference, of course, is about 15 orders of magnitude. In just the 50 years since magnetic hard disks were introduced, the information density has increased by a factor of 100 million, faster than Moore's Law for computer chips. However, he said, we will soon reach the point where the magnetic domains in continuous media will be so small as to become unstable, necessitating a transition to "patterned media," in which isolated, single-grain magnetic bits are arranged on a substrate, i.e., nanotechnology.

Bader went on to discuss several approaches to fabricating these nanostructures, such as the use of diblock copolymers (polymer chains that can self-assemble into striped arrays) to guide the arrangement of nanomagnetic structures (a "hierarchical" approach) and the use of magnetic viruses (in which the virus's DNA is replaced by ferromagnetic material) to build nanomagnetic structures (a "bottom-up" approach). He also discussed the challenge of producing composite magnetic materials that interweave, on the nanoscale, the properties of hard and soft magnets. Such materials could exhibit higher magnetic performance by a factor of two or three than the world's strongest commercial permanent magnets of today, leading to the prospect of saving energy, by, for example, enabling lighter, more efficient motors. Bader concluded his talk by listing the "grand challenges" of nanomagnetism: ultrastrong permanent magnets, ultrahigh density media, spin transistors, nonvolatile random-access memory, programmable magnetic logic, hierarchically assembled media, and nanobiomagnetic sensors.

5. REMINDER: GENERAL USER PROPOSALS DUE JULY 7 (Contact: alsproposals@lbl.gov)

The User Services Office is still accepting general user proposals from scientists who wish to conduct research in the general sciences at the ALS during the running period from January through June 2005. The deadline for submissions is Wednesday, July 7, 2004. (This deadline does not apply to protein crystallography proposals, which have a separate process and schedule.) Scientists wishing to renew a previous proposal must download the short "ALS Experiment Report and Request for Beamtime" form (see link below) and submit it to the User Services Office by the July 7 deadline. Proposals cannot be renewed for more than three cycles after they are first submitted. The following resources are available for further information:

ALS User Services Administrator
alsuser@lbl.gov

General user proposal process (new proposals only)
<http://www-als.lbl.gov/als/quickguide/independinvest.html>

ALS online forms
<http://alsusweb.lbl.gov/>

ALS Experiment Report and Request for Beamtime (renewals only)
http://www-als.lbl.gov/als/quickguide/experiment_report.doc

Beamline information
http://www-als.lbl.gov/als/als_users_bl/bl_table.html

Proposal Study Panel (PSP) scores
<http://www-als.lbl.gov/als/quickguide/pspscores.html>

6. WORKSHOP ON SOFT X RAYS AT THE ADVANCED PHOTON SOURCE (Contact: Richard Rosenberg, rar@aps.anl.gov)

The Advanced Photon Source (APS) will hold a workshop August 5 - 6, 2004, on "Frontier Science Using Soft X-Rays at the APS." The goal is to assemble a group of researchers involved with cutting-edge research to discuss prospects for expansion of the APS in the soft x-ray regime. Space is limited to 50 participants, so it is advisable to register, online, as soon as possible. For

additional information, contact Richard Rosenberg (rar@aps.anl.gov) or go to the workshop Web site at http://www.future.aps.anl.gov/Future/Workshops/Frontier_Science_Using_Soft_Xrays .

7. OPERATIONS UPDATE

(Contact: Ed Lampo, Lampo@lbl.gov)

For the user runs scheduled between June 10 and June 27, the beam reliability (time delivered/time scheduled) was 96%. Of the scheduled beam, 93% was delivered to completion without interruption. There were a few minor problems that delayed initial startup (after the shutdown), but overall there were no significant outages.

Long-term and weekly operations schedules are available on the Web at <http://www-als.lbl.gov/als/schedules/index.html> . Requests for special operations use of the "scrubbing" shift should be sent to Jan Pusina (ALS-CR@lbl.gov, x4738) by 1:00 p.m. Friday. The Accelerator Status Hotline at (510) 486-6766 (ext. 6766 from Lab phones) features a recorded message giving up-to-date information on the operational status of the accelerator. A Web page showing the ring status in real time can be found at <http://www-als.lbl.gov/als/status/> .

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http://www-als.lbl.gov/als/als_news/

To subscribe, unsubscribe, or change your delivery address for the email version of ALSNews, send a message indicating your wishes and including your name and email address to alsnews@lbl.gov. We welcome suggestions for topics and content.

LBNL/PUB-889

Editors: Istamura@lbl.gov, alrobinson@lbl.gov

This work was supported by the Director, Office of Science, Office of Basic Energy Sciences, of the U.S. Department of Energy under Contract No. DE-AC03-76SF00098.

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Current issue online at http://www-als.lbl.gov/als/als_news/

1. STRUCTURE OF A DNA CLAMP - LOADER COMPLEX

by Dan Krotz

(Contact: John Kuriyan, kuriyan@berkeley.edu)

Sliding clamps are ring-shaped proteins that encircle DNA and enable polymerases--enzymes that replicate DNA--to relax and regain their hold on DNA strands without losing their place, despite the considerable torque that results from the production of double-helical DNA. In addition to their role in DNA replication, sliding clamps are also involved in several other processes that require a mobile contact on DNA. Hoping to shed light on this important but still poorly understood mechanism, a trio of researchers from Berkeley and New York have obtained the crystal structure of a sliding clamp in complex with a clamp loader assembly that is "powered" by the hydrolysis of ATP. The researchers found a spiral structure in the clamp loader with a striking correspondence to the grooves of the DNA double helix. The crystal structure suggests a simple explanation for how interaction with the double helix triggers ATP hydrolysis and the release of the sliding clamp.

Read the full story at

http://www-als.lbl.gov/als/science/sci_archive/80slidingclamp.html

Publication about this research: G.D. Bowman, M. O'Donnell, and J. Kuriyan, "Structural Analysis of a eukaryotic sliding DNA clamp - clamp loader complex," *Nature* **429**, 724 (2004).

2. SECRETARY OF ENERGY SPENCER ABRAHAM VISITS ALS

Secretary Abraham made a return visit to the ALS on Tuesday, July 7. Accompanied by Berkeley Lab Deputy Director Pier Oddone and the Lab's Director-to-be Steven Chu, the Secretary toured the ALS and listened to a presentation by David Attwood (Materials Sciences Division) about recent research using extreme ultraviolet (EUV) lithography and its application to developing small, powerful semiconductors.

Abraham was also shown the imaging of proteins at the Macromolecular Crystallography Facility. Gerry McDermott (Physical Biosciences Division) illustrated the prospect of a leukemia-fighting drug via the characterization of a protein that regulates white blood cell production. And Physical Biosciences Division Director Graham Fleming noted the Lab's collaboration with the Howard Hughes Medical Institute, whose two beamlines are studying biomedically important molecules as a framework for understanding how molecules function and interact.

An extended article on the visit can be found online at
<http://www.lbl.gov/Publications/Currents/Archive/Jul-09-2004.html>

3. SMALL-MOLECULE CRYSTALLOGRAPHY BEAMLINE COMMISSIONED (Contact: Sirine Fakra, SFakra@lbl.gov)

A revolution in material-synthesis techniques--requiring the ability to verify the crystal structures produced--is the driving force behind the need for a massive capacity for obtaining structural solutions of small-molecule systems with small crystal sizes. In these materials, the number of atoms per unit cell is too great for powder techniques and the size of the crystals is too small to be obtained using single-crystal laboratory systems. The combination of an ALS bend-magnet source at Beamline 11.3.1 together with simple, brightness-preserving, compact optics provides the intense x-ray radiation necessary for studies of crystals that, because they are extremely small or weakly diffracting, would be difficult or impossible to study on standard laboratory systems. The beamline has been successfully commissioned and will be available to general users beginning August 1.

Read the full story at
http://www-als.lbl.gov/als/als_news/news_archive/vol.243_072804.html#3

4. SAC MEETING HIGHLIGHTS ENVIRONMENTAL RESEARCH (Contact: Ben Feinberg, B_Feinberg@lbl.gov)

The ALS Scientific Advisory Committee (SAC), which is charged with advising Berkeley Lab and ALS management on issues relating to ALS operations, resource allocation, and strategic planning, met June 15 - 16. Environmental research at the ALS got top billing on the agenda. Satish Myneni (Princeton University) gave a presentation on "Understanding the Dynamics of Environmental Processes," followed by Matthew Marcus (ALS) on "Micro-XAFS with Micro-XRD." After a short break, Hoi-Ying Holman (Earth Sciences Division) and David Shuh (Chemical Sciences Division) provided the committee with updates on activities at Beamlines 1.4 and 11.0.2, respectively. A talk by Ernest Majer (Earth Sciences Division) closed out the morning presentations. The afternoon session included discussion of a proposal for a new protein crystallography superbend beamline from APIC (Advanced Protein Crystallography Industrial Consortium) and a report on Proposal Study Panel (PSP) issues by Neville Smith (ALS). On the second day, committee members tackled a review of protein crystallography Beamline 5.0.2 and conducted a freewheeling discussion on recent strategic planning efforts, including a report on last month's Users' Executive Committee (UEC) retreat by UEC Chair Dennis Lindle.

Current members of the advisory committee are listed online at
<http://www-als.lbl.gov/als/ourorg/sac.html>

5. ALS DOCTORAL FELLOWSHIP WINNERS ANNOUNCED (Contact: Zahid Hussain, ZHussain@lbl.gov)

The ALS is extremely pleased to announce this year's winners of ALS Doctoral Fellowships:

Christopher Cappa (University of California, Berkeley), physical chemistry; Yulin Chen (Stanford University), spin-resolved photoemission spectroscopy; Henry Fu (University of California, Berkeley), correlated electron physics; Johnathon Holroyd (Montana State University), physics/magnetic materials; Timothy Learmonth (Boston University), physics; John Strachan (Stanford University), condensed matter physics/magnetism; Michelle Weinberger (University of

California, Los Angeles), physical/materials chemistry; and Feng Wang (University of Michigan), solid state physics.

These exceptional Ph.D. students have been selected to perform a major part of their thesis work at the ALS during a one-year appointment covering the 2004 - 2005 academic year. For Yulin Chen and Feng Wang, this will be a continuation of their fellowship grants from last year. Congratulations to all eight!

The selection committee consisted of Sam Bader (Argonne National Laboratory and SAC Chair), Dennis Lindle (University of Nevada, Las Vegas, and UEC Chair), Anders Nilsson (Stanford University), Zahid Hussain (ALS), and Neville Smith (ALS).

Detailed information about the fellowships can be found at <http://www-als.lbl.gov/als/fellowships/index.html>

6. 2004 ALS USERS' MEETING UPDATE (Contact: alsum@lbl.gov)

General information, meeting deadlines, and online registration for this year's ALS Users' Meeting, to be held at Berkeley Lab October 18 - 20, is available on the Users' Meeting Web site at <http://www-als.lbl.gov/als/usermtg/>. The early registration deadline is Friday, October 1. Information about accommodations for meeting participants in local hotels is available at <http://www-als.lbl.gov/als/usermtg/lodging.html>.

The deadline for submitting abstracts for oral and poster presentations is Wednesday, September 15. See instructions for online submissions at <http://www-als.lbl.gov/als/usermtg/abstracts.html>.

This year, ten focused workshops will follow the end of the formal Users' Meeting program beginning Tuesday, October 19, through Wednesday, October 20. The workshop topics and their organizers are as follows:

Actinide Spectroscopy at the ALS
David Shuh and Jim Tobin

Advances in Crystallographic Data Analysis and Acquisition
Christine Trame

Magnetic Nanostructures, Interfaces, and New Materials: Theory, Experiment, and Applications
Elke Arenholz and Yves Idzerda

Nanoscience at Synchrotrons
Franz Himpsel and Louis J. Terminello

New Complex Materials for Synchrotron Science
Byron Freelon and R. Ramesh

New Directions in Hard X-Ray Spectroscopy and Spectromicroscopy
Matthew Marcus

Photon-In and Photon-Out X-Ray Spectroscopy in Material Sciences, Environmental Energy, and Chemical Analysis
Jonathan Denlinger and Jinghua Guo

X-Ray Microscopy: Advances and Challenges
Carolyn Larabell and Mark LeGros

What's Behind the Shielding? An ALS Accelerator Tutorial
David Robin

Modern Valence Band Photoemission Spectroscopy: The Legacy of
W.E. Spicer and a Powerful Tool for Materials
(Joint ALS-SSRL workshop to be held at SSRL)
Ingolf Lindau, Piero Pianetta, Zhi-Xhu Shen, and Neville Smith

Interested participants are encouraged to contact the workshop leaders directly for more detailed information about workshop agendas and speakers.

7. OPERATIONS UPDATE

(Contact: David Richardson, DBRichardson@lbl.gov)

For the user runs scheduled between June 30 and July 26, the beam reliability (time delivered/time scheduled) was 95%. Of the scheduled beam, 90% was delivered to completion without interruption. Two significant problems accounted for most of the outage time: a damaged power supply for the SR12 superbend magnet and a sequence of overtemp trips at the SR01C QFA magnet.

Long-term and weekly operations schedules are available on the Web at <http://www-als.lbl.gov/als/schedules/index.html> . Requests for special operations use of the "scrubbing" shift should be sent to Jan Pusina (ALS-CR@lbl.gov, x4738) by 1:00 p.m. Friday. The Accelerator Status Hotline at (510) 486-6766 (ext. 6766 from Lab phones) features a recorded message giving up-to-date information on the operational status of the accelerator. A Web page showing the ring status in real time can be found at <http://www-als.lbl.gov/als/status/> .

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Editors: lstamura@lbl.gov, alrobinson@lbl.gov

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Current issue online at http://www-als.lbl.gov/als/als_news/

1. STARTING THE RNA ASSEMBLY LINE

by Bruce Balfour

(Contact: David Bushnell, bushnell@stanford.edu)

Protein crystallography images from the ALS have helped researchers from Stanford University to analyze the inner workings of RNA and its role in turning DNA's genetic blueprint into working proteins. RNA polymerase II (Pol II) is the protein complex responsible for all messenger RNA production. TFIIB and TBP are transcription factors that interact with Pol II to start the transcription assembly line. The researchers determined the structure and function of Pol II-TFIIB complexes, offering the first real understanding of the defining events of DNA transcription.

Read the full story at

http://www-als.lbl.gov/als/science/sci_archive/79rna_assembly.html

Publications about this research: D.A. Bushnell, K.D. Westover, R.E. Davis, and R.D. Kornberg, "Structural Basis of Transcription: An RNA Polymerase II - TFIIB Cocrystal at 4.5 Angstroms," *Science* 303, 983 (2004); K.D. Westover, D.A. Bushnell, and R.D. Kornberg, "Structural Basis of Transcription: Separation of RNA from DNA by RNA Polymerase II," *Science* 303, 1014 (2004).

2. TARGETING PROTEINS TO MEMBRANES

by Art Robinson

(Contacts: Robert Stroud, stroud@msg.ucsf.edu; Pascal Egea, pascal@msg.ucsf.edu)

For the new protein emerging from a ribosome amino acid by amino acid, the journey toward its final functional state may involve integration into or secretion through a membrane whenever the protein's polypeptide chain exhibits a particular sequence (signal sequence). A signal recognition particle (SRP) binds to the sequence and carries the ribosome - protein complex to the membrane, where the SRP associates with its membrane receptor (SR). The ribosome - protein complex is then released and selectively attaches to the translocon, a channel in the membrane. Guanine triphosphate (GTP) plays an essential role, both in assembling the SRP - SR targeting complex and, when hydrolyzed, in driving its dissociation. The SRP and SR stimulate each other's activity as GTPases to catalyze the GTP hydrolysis.

Read the full story at
http://www-als.lbl.gov/als/science/sci_archive/82protein_membrane.html

Publication about this research: P.F. Egea, S. Shan, J. Napetschnig, D.F. Savage, P. Walter, and R.M. Stroud, "Substrate twinning activates the signal recognition particle and its receptor," *Nature* 427, 215 (2004).

3. IMPACT OF TOP-OFF INJECTION EVALUATED

(Contacts: David Robin, DSRobin@lbl.gov; Christoph Steier, CSteier@lbl.gov; Tony Warwick, T_Warwick@lbl.gov)

As many of you know, there are plans to upgrade the ALS to operate in a top-off injection mode. In top-off mode, electrons will be frequently injected into the storage ring (every half minute or so), keeping the storage-ring current nearly constant, as opposed to our present operation where the storage ring is filled only once every 8 hours. Top-off operation has many advantages compared to our present operational mode. We expect a twofold increase in the average current (see Fig. 1 at http://www-als.lbl.gov/als/als_news/news_archive/vol.244a.html#1). In addition, there will be further increases in the brightness--due to reduction of the beam size and the minimum gap of insertion devices--and improvements in the thermal stability of the storage ring and beamline components. Top-off operation is the standard operational mode at a number of other light sources, including the Advanced Photon Source, Swiss Light Source, and Spring-8.

One of the main concerns with top-off is the impact of the injection process on the ALS users. In top-off, the beamline shutters remain open during injection and the injection process itself is not completely transparent to all users. In particular, the injection magnets perturb the stored beam during injection. At present, there is a fast oscillation caused by nonclosure of the fast-pulsed injection bump magnets, as well as a slower closed-orbit distortion caused by decaying eddy currents in the main septum magnet (see Figs. 2 and 3 at http://www-als.lbl.gov/als/als_news/news_archive/vol.244a.html#2).

This past year a number of measurements were performed to evaluate the impact of the injection process on users. During three accelerator physics shifts, experiments were performed with representatives of various beamlines--1.4, 4.0.2, 5.3.2, 6.3.2, 7.0.1, 7.3.1, 8.3.1, 10.0.1, 10.3.2, 11.0.2, and 12.0. The measurements were taken with the injection elements both on and off. The results were presented at several meetings, including a spring Users' Executive Committee (UEC) meeting, and are summarized in ALS Light Source Note LSBL-709 (available at http://www-als.lbl.gov/als/als_news/news_archive/vol.244a.pdf).

The results of these studies showed that most of the experiments did not see the injection transients. However, microscopes with short integration times were affected. By far the most sensitive technique was STXM, with transient intensity fluctuations from 5% to 40%, depending on whether the septum magnet was pulsing. In addition, the infrared beamline could detect these injection transients. Gating seems to be a requirement for these sensitive experiments and injection timing pulses will be provided for this purpose. In addition, Beamline 4.0.2 saw the effect of the septum magnet. We are currently in the process of reducing the impact of the septum on the beam transients. For additional information please contact us or refer to the above mentioned note. The top-off project will also be discussed in detail at a workshop at the Users' Meeting in October.

4. ATTENTION: CAMSHAFT AND BUNCH-GAP USERS (Contacts: David Robin, DSRobin@lbl.gov; Christoph Steier, CSteier@lbl.gov)

In the ALS storage ring there are 328 rf "buckets" that can be filled with electron bunches. Each of these buckets is separated by 2 ns. In present operation, the filling pattern in the storage ring typically is as follows: a train of buckets 1 through 276 and bucket 318 (the so-called camshaft bunch) are filled with electrons. So between buckets 276 and 318 there is a gap of 84 ns and between buckets 318 and 1 there is a gap of 22 ns.

If possible we would like to reduce these gaps for two reasons. First, larger gaps reduce the beam lifetime. Second, with the present gaps the longitudinal spacing between bunches is not uniform and changes by more than the bunch length over the course of a fill. This presents major challenges for laser synchronization.

We would like to find out who is currently using the camshaft bunch and/or the empty gaps and how large a gap is necessary. Please send a brief summary of your requirements and their rationale to Christoph Steier (CSteier@lbl.gov) by September 15. Thank you very much.

5. ALS USERS AND STAFF WELL REPRESENTED AT VUV XIV (Contact: Neville Smith, NVSmith@lbl.gov)

The center of gravity of the synchrotron world shifted down under this summer (or is it winter?) as the Fourteenth International Conference on Vacuum Ultraviolet Radiation Physics (VUV XIV) was held July 19 - 23, 2004, in Cairns, Australia. This was the first visit to the Southern Hemisphere in the 40-year history of the VUV conference series, which began in Los Angeles in 1962 and is now run triennially. The ALS hosted VUV XII in 1998. The premier international conference covering research in the vacuum ultraviolet and soft x-ray range, VUV XIV brought together physicists, engineers, chemists, biologists, technologists, and others concerned with the production and applications of vacuum-ultraviolet and soft x-ray radiation over many subfields.

The ALS was well represented in the program, with an impressive number of users and staff listed among the event's invited speakers. Two of the five plenary speakers were ALS users: Reinhard Doerner (Univ. of Frankfurt) spoke to the entire conference on "Electrons from fixed-in-space molecules and clusters" and Adam Hitchcock (McMaster Univ.) addressed the assembly on "Soft x-ray spectromicroscopy of biological and synthetic polymer systems." Invited speakers with ALS ties include Elke Arenholz (ALS) on "Vectormagnetometry studies of exchange biased systems using soft x-ray magnetic dichroism;" Steve Kevan (Univ. of Oregon) on "Coherent soft-X-ray magnetic scattering;" Carolyn Larabell (Berkeley Lab, Life Sciences Div.) on "X-ray tomography: Cells in 3-D at better than 50 nm resolution;" Norman Mannella (Stanford Univ.) on "Electron localization, polarons and clustered states in manganites;" Michael Martin (ALS) on "Synchrotron infrared science: Physics, biology, environmental science and coherence;" Francois Wuilleumier (Univ. Paris-Sud) on "Photoionization of excited atoms and ions: Recent progress and future prospects;" and Han Woong Yeom (Yonsei Univ.) on "Electronic transitions of atomic wires on surfaces."

A number of ALS users and staff also gave 15-minute "Hot Topics" talks: Nora Berrah (Western Michigan Univ.) on "Inner-shell dynamic studies in negative ions," John Bozek (ALS) on "Spin resolved inner-shell photoelectron spectroscopy of Xe clusters," Tony van Buuren (Lawrence Livermore National Laboratory) on "X-ray absorption and emission studies of diamond nanoparticles," Phil Heimann (ALS) on "Ultrafast x-ray absorption spectroscopy of laser-excited materials," Daniel Rolles (Fritz-Haber-Institut) on "Probing the degree of core hole localization in isotope substituted N₂ via photoelectron spectroscopy," and Eli Rotenberg (ALS) on "Spin density wave phase diagram of Cr(110) thin films." Look for the conference proceedings to be published as

a special issue of the peer-reviewed Journal of Electron Spectroscopy and Related Phenomena. The next conference, VUV XV, will be held in 2007 in Berlin, Germany.

6. EXPERTS MEET FOR REVIEW OF PHOTOEMISSION AT ALS (Contact: Neville Smith, NVSmith@lbl.gov)

Several leading photoemission researchers came to the ALS last month to participate in a crosscutting review on the future of photoemission at the ALS. The two-day meeting, held July 29 - 30 at Berkeley Lab, drew capacity crowds. Neville Smith (ALS Division Deputy for Science) began by stating the charge to the committee: To identify the elements of a world-leading photoemission program at a facility like the ALS with a ten-year horizon. In a slight departure from past formats, this crosscutting review was conducted as a workshop in which the reviewers themselves made presentations.

The first session, "Whither Photoemission?" featured Stefan Hufner (Univ. des Saarlandes), who discussed very high resolution photoemission experiments, and Ward Plummer (Univ. of Tennessee), who addressed the question, Who needs synchrotron radiation? Mike Norman (Argonne National Lab) followed up by providing a theoretical perspective. The second session dealt with correlated systems, and Z.X. Shen (Stanford Univ.) gave a talk with the intriguing title, "The Holy Grail." In a session on low dimensionality, Franz Himpsel (Univ. of Wisconsin-Madison) talked about nanostructures, and in a session on catalysis, Frank Ogletree (Berkeley Lab, Materials Sciences Div.) discussed ambient-pressure photoemission. Zahid Hussain (ALS Scientific Support Group Leader) rounded out the presentations with a look at "Activity at the ALS: Present and Future." Each of the sessions also included time for "nuggets" (Steve Kevan's term for brief presentations on highly focused topics) and open discussion amongst attendees. Reports generated as a result of this workshop will be used in future strategic planning efforts at the ALS.

7. USERS' MEETING UPDATE; CALL FOR AWARD NOMINATIONS (Contact: alsum@lbl.gov)

Each year, the ALS UEC presents awards to scientists and staff who have made significant contributions to the ALS scientific and user support programs. This year, the UEC invites ALS users and staff to submit nominations for any or all of the following awards: the David A. Shirley Award for Outstanding Scientific Achievement at the Advanced Light Source, the Klaus Halbach Award for Innovative Instrumentation at the Advanced Light Source, and the Tim Renner User Services Award. The nominations may be for an individual or a group, and a brief rationale for each nomination is required.

Past award winners, along with a representative from the UEC and the ALS, will serve on the award selection committee. To submit a nomination, go to the 2004 ALS Users' Meeting Award Nominations Web page at <http://www-als.lbl.gov/als/usermtg/nominations.html> . The deadline for nominations is Friday, October 1. The awards will be presented at the ALS Users' Meeting dinner/buffet on Tuesday, October 19.

General information, deadlines, and online registration for this year's ALS Users' Meeting is available on the Users' Meeting Web site at <http://www-als.lbl.gov/als/usermtg/> . The early registration deadline is Friday, October 1. The deadline for abstract submissions for oral and poster presentations is Wednesday, September 15.

This year, ten workshops will follow the end of the formal Users' Meeting program. For detailed information about workshop agendas and speakers, you may contact the workshop organizers directly at <http://www-als.lbl.gov/als/usermtg/workshops.html> .

8. OPERATIONS UPDATE

(Contact: David Richardson, DBRichardson@lbl.gov)

For the user runs scheduled between July 28 and August 22 (with two-bunch operation from August 11 to 22), the beam reliability (time delivered/time scheduled) was 95.6%. Of the scheduled beam, 97.1% was delivered to completion without interruption. There were no significant outages.

Long-term and weekly operations schedules are available on the Web at <http://www-als.lbl.gov/als/schedules/index.html> . Requests for special operations use of the "scrubbing" shift should be sent to Jan Pusina (ALS-CR@lbl.gov, x4738) by 1:00 p.m. Friday. The Accelerator Status Hotline at (510) 486-6766 (ext. 6766 from Lab phones) features a recorded message giving up-to-date information on the operational status of the accelerator. A Web page showing the ring status in real time can be found at <http://www-als.lbl.gov/als/status/> .

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LBNL/PUB-889

Editors: lstamura@lbl.gov, alrobinson@lbl.gov, ejmoxon@lbl.gov

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1. BRINGING THE MESOSCALE INTO FOCUS

by Julie McCullough

(Contact: Carolyn Larabell, CALarabell@lbl.gov)

X-ray tomography is the first high-throughput imaging technology that generates images of whole, hydrated cells at better than 60 nm resolution. With it, researchers from Berkeley Lab have obtained three-dimensional views of the internal structure of whole, hydrated *Saccharomyces cerevisiae* cells, bridging the mesoscale resolution "gap"--the middle area between light (200 nm) and electron microscopy (3 angstroms). With the ALS transmission x-ray microscope, data collection is fast (under 3 minutes) and relatively easy (like light microscopy), producing high-resolution, absorption-based images (like electron microscopy) that provide contrast between cellular structures and allow for discernment of individual structures. After data collection, tomographic techniques are used to reconstruct the original information into quantifiable three-dimensional views of the entire cell. Through the use of computer algorithms, the researchers then process the reconstructed data to create made-to-order images of whole cells and their internal structures.

Read the full story at

http://www-als.lbl.gov/als/science/sci_archive/81tomography.html

Publication about this research: C.A. Larabell and M.A. Le Gros, "X-ray tomography generates 3-D reconstructions of the yeast, *Saccharomyces cerevisiae*, at 60-nm resolution," *Molecular Biology of the Cell* 15, 957 (2004).

2. ORGANIC MATTER IN INTERPLANETARY DUST

by Lori Tamura

(Contact: Christine Floss, floss@wustl.edu)

Since long before life appeared on Earth, a constant flux of carbonaceous (carbon-containing) dust has rained down from the sky, at times accreting as much as a centimeter deep over the Earth's surface every million years. Such dust particles are complex assemblages of primitive interplanetary material left over from the formation of the solar system. One such interplanetary dust particle (IDP), collected by NASA from Earth's stratosphere and nicknamed "Benavente," was analyzed by

researchers from Washington University and Lawrence Livermore National Laboratory using a variety of techniques, including synchrotron infrared spectroscopy at the ALS. The measurements revealed, for the first time in an IDP, an isotopically anomalous region both depleted in carbon-13 and enriched in nitrogen-15, located in a host phase that is organic in nature. These isotopic anomalies provide valuable clues to the history of the particle and, by extrapolation, the solar system.

Read the full story at

http://www-als.lbl.gov/als/science/sci_archive/83spacedust.html

Publication about this research: C. Floss, F.J. Stadermann, J. Bradley, Z.R. Dai, S. Bajt, and G. Graham, "Carbon and nitrogen isotopic anomalies in an anhydrous interplanetary dust particle," *Science* 303, 1355 (2004).

3. UNUSUAL ISOTOPE EFFECT IN Bi2212

by Art Robinson

(Contact: Alessandra Lanzara, ALanzara@lbl.gov)

Magnetism or lattice vibrations? After almost 18 years of intense experimental and theoretical effort since the discovery of the first cuprate high-temperature superconductor (HTSC), physicists still do not know the origin of this most intriguing of solid-state phenomena. Working at the Advanced Light Source, a team of Berkeley Lab, University of California, Berkeley, and University of Tokyo researchers has come up with evidence from angle-resolved photoemission spectroscopy (ARPES) that strongly implicates lattice vibrations, but in an unconventional way that leaves room for magnetism as well.

Read the full story at

http://www-als.lbl.gov/als/science/sci_archive/85isotope.html

Publication about this research: G.-H. Gweon, T. Sasagawa, S.Y. Zhou, J. Graf, H. Takagi, D.-H. Lee, and A. Lanzara, "An unusual isotope effect in a high-transition-temperature superconductor," *Nature* 430, 187 (2004).

4. JANOS KIRZ ADDRESSES STAFF AT TOWN HALL MEETING

On September 21, ALS Acting Director Janos Kirz held a "town hall" meeting to talk about his perceptions after 100 days on the job, encompassing where we are now, the Washington scene, recent accomplishments, and what's coming up, in both the short and long term. He prefaced his remarks with a brief update on Daniel Chemla, reporting that Daniel continues to improve slowly and stays involved in what's happening at the ALS, even suggesting speakers for next month's Users' Meeting. Janos credits Daniel for the high credibility that the ALS currently enjoys in Washington, where he said the ALS is viewed as a world-leading facility in vacuum ultraviolet and soft x-ray science, with a successful, productive user program that will nevertheless need to do more with less in the future. The ALS has a lot to be proud of, he said, and we need to present it all in the best possible way.

A statistical snapshot of the ALS showed that the past trends of user growth coupled with flat funding are expected to continue, while publications have leveled off at a healthy level consistent with a mature facility. Given the projected growth in both users and beamlines and the consequent crowding, Janos emphasized safety as a top priority, asking everyone to report any safety hazards. Diversity issues were also highlighted, and Janos specified two goals for 2004: increasing the ALS

applicant pools of women and minorities, both of which are underrepresented, and educating employees about the benefits of diversity in the workplace.

Janos then described some of the ALS's accomplishments of the past year, including machine improvements, new beamlines, and new science. A major facility development was the installation of a new wiggler (W11) in Sector 5 that will simultaneously allow the optimum operation of femtosecond slicing work as well as improved protein crystallography operation. The ALS is also on track to achieve all of this year's goals for the top-off upgrade, including determining its impact on users, identifying engineering challenges, and testing solutions. Four new beamlines came online in the past year--11.0.2 (MES), 8.3.2 (tomography), 12.3.1 (SIBYLS), and 12.2.2 (high pressure)--and all have begun productive scientific programs. Janos next cited a litany of recent scientific accomplishments, ranging from evidence for electron - phonon coupling in high-temperature superconductors, to the creation of an antiferromagnetic exchange spring, to imaging 3D objects using lensless coherent x-ray diffraction.

What does the future hold for the ALS? For the near term, several new beamlines are under development: 11.0.1 (PEEM-3), 12.3.2 (microdiffraction), 6.0 (femtosecond phenomena), 4.0.1 (MERLIN), and 2.1 (XM-2). For the long term, strategic planning efforts are underway with the goal of keeping the ALS at the cutting edge for the next 20 to 30 years. Ingredients of such a plan will include facility upgrades, new scientific programs in line with DOE priorities and Berkeley strengths, construction of user housing and support buildings, and developments in detectors, optics, and theory. Criteria for successful projects are that they will address important scientific questions, have a strong user group to make the case, and bring new world-class capabilities to the ALS. Preferably, they will fit with the ALS mission as well as with the "facts on the ground" (i.e., there is room to build) and be relatively economical. These issues will be discussed at the Users' Meeting in October, where stakeholders are encouraged to provide feedback. The plan will be finalized in time for a major Department of Energy review coming up in February.

5. WIRELESS NETWORKS AVAILABLE: NETWORKING DO'S AND DON'TS (Contact: Alan Biocca, AKBiocca@lbl.gov)

WIRELESS NETWORKING. Recently the ALS has installed wireless networking for users in most areas of Buildings 6 and 80. Service complies with IEEE standard 802.11a at up to 54 Mbps and 802.11b at up to 11 Mbps. These wireless networks are open; view the available networks in your wireless network application and select the strongest signal. Users without wireless networking can plug into an available open network port on a regular beamline network (NOT the special controls networks, which cannot access the Internet and should not be used without special permission). Contact a beamline scientist for help in determining which network port to use. After connecting to either the wireless or wired network, go to the NETS database at <http://nets.lbl.gov> (a Berkeley Lab LDAP password is required) and fill out and submit the form there regarding your computer. This will facilitate reaching you in case there is a problem. If access to ALS computing resources is required, it may be necessary to use the wired network or to use the Laboratory's virtual private network (VPN) service via the wireless net (<http://www-lblnet.lbl.gov/vpn.html>).

COMPUTER SECURITY. In the current climate of computer worms, viruses, stolen credentials, and frequent patching, it is important to keep all computers up to date and free of undesired programs. The Laboratory has a strong computer security program, an important component of which is the active scanning of machines for vulnerabilities that are considered critical, i.e. those that can lead to immediate and serious compromises from known attacks. (Note: an unpatched machine on the Internet will be compromised in 20 minutes, on average, based on a recent study.) An effort is made to contact the machine owner to resolve the issue, but it may be necessary to block the machine from the network on very short notice. In some cases it is not practical to find the machine owner (or they are not known), so no warning is possible. In cases where the vulnerabilities are less

severe, the response is reduced--notices are emailed, etc. Only severe or long-ignored issues generally result in blocking. Scanning occasionally has undesired side effects, such as stopping a service on a machine or causing it to crash. This occurs because there are bugs in the system software. The Laboratory will soon be scanning all networks open to the Internet on a daily basis. In the past we have not allowed ALS networks to be scanned, but this is changing.

WHAT YOU CAN DO. Ensure that all critical updates are installed on all systems and that systems are virus- and worm-free. Install and configure a host-based firewall to provide an extra layer of protection. Make sure your systems are all correctly registered in the NETS online database that is used to contact system owners. Avoid using newly connected systems for critical data collection, especially for a day or so after they are connected to the network. Critical machines are best kept off-net or on the private networks that are available on some beamlines. Do not use important machines for email, surfing the Web, or other higher-risk activities. Use quality passwords, disable unnecessary services, and never allow passwords to be on the network "in the clear"--use secure shell or VPN services to protect remote access. For detailed information, refer to Chapter 9 of Berkeley Lab's Regulations and Procedures Manual (<http://www.lbl.gov/Workplace/RPM/>).

Remotely accessing accounts across the network exposes your credentials to programs that may have been modified to collect them. This is especially a problem when computing in a low-security environment. Many university computers have been compromised in this way. Be very careful of where you use your passwords. Passwords used from insecure or questionable locations should be changed. Passwords used for remote access should be changed frequently. Keep separate passwords for different systems. The best way to access remote services is from your own secure computer using your own copy of secure shell using public keys rather than regular passwords.

IF YOU HAVE A PROBLEM. If you have a problem connecting to the wireless or wired networks, suspect that you have a computer virus or worm problem, find indications of someone else logging in to your accounts (files you don't recognize, etc.), or if you suddenly cannot log in--contact the Help Desk at 486-HELP.

Computer security depends on each of us.

6. PHILIP BUCKSBAUM COLLOQUIUM: ULTRAFAST QUANTUM CONTROL (Contact: Philip Bucksbaum, phb@umich.edu)

Philip Bucksbaum, the University of Michigan's Otto Laporte Professor of Physics and Director of the Frontiers in Optical and Coherent Ultrafast Science (FOCUS) Center, gave last month's ALS colloquium, titled "Quantum control if you know what you are doing... or if you don't." The essential tool of quantum control is the shaped radiation pulse. Such a pulse is generated when an ultrafast, smooth, large-bandwidth laser pulse is passed through phase and amplitude filters to spread out its various frequencies into a unique temporal profile. This shaped pulse can then be used to control dynamics in matter. The objective is a new quantum state of the physical system, such as a new chemical, a special kind of light, or an excited state of a molecule with special properties.

For example, in well-understood systems such as Rydberg atoms (i.e., where you know what you are doing), shaped pulses can be used to store bits of information--a rudimentary form of quantum computing. Shaped pulses can also be used to manipulate more complicated condensed-phase systems where the Hamiltonian is unknown (i.e., where you don't know what you're doing). In such cases, Bucksbaum said, the molecule "knows" its state, even if you don't. Scientists can "ask" the system what works by repeatedly using shaped pulses that "evolve" according to learning algorithms that mimic evolutionary processes. The experimental apparatus interrogates the atom or molecule, which provides direct feedback to the laser. The laser system and the quantum system

work together through a trial-and-error approach to find the pulse shape that produces the desired dynamics. This is a new way to investigate the properties of many-body quantum systems, and has promise for new chemicals, new methods for quantum computing, or more efficient ways to produce and control x rays.

Philip Bucksbaum is an alumnus of the University of California, Berkeley, where he and Berkeley Lab's new director, Steven Chu, worked together in Gene Commins' research group. Over the next year, Bucksbaum will be on sabbatical at the Stanford Linear Accelerator Center working on applications of ultrafast quantum control in connection with the Linac Coherent Light Source, the world's first x-ray free-electron laser, scheduled to begin construction in fiscal year 2005. More information on quantum control can be found at the Bucksbaum Group's Web site at <http://gomez.physics.lsa.umich.edu> .

7. ALS AWARDS AND HONORS: SAYKALLY, CAVALLERI

The ALS is pleased to acknowledge and congratulate those in its orbit whose achievements have been recognized through awards and honors.

The Department of Energy's Office of Science has presented the Ernest Orlando Lawrence Award in Chemistry to ALS user Richard Saykally (Chemical Sciences Division, Berkeley Lab, and Univ. of California, Berkeley). The award acknowledges scientists and engineers for their exceptional contributions to the development, use, or control of nuclear energy. The Lawrence Award pays tribute to Saykally's "invention of velocity modulation spectroscopy of molecular ions; for the development of far infrared vibration-rotation spectroscopy of radicals, clusters and carbon chains; for the elucidation of the structure and potential energy surfaces for water clusters; and for the development and application of cavity ringdown laser spectroscopy techniques." To read a Berkeley Lab press release on Saykally's receipt of the award, go to <http://www.lbl.gov/Science-Articles/Archive/CSD-Saykally-EOL-Award.html> .

ALS user Andrea Cavalleri (Materials Sciences Division, Berkeley Lab) recently returned from a trip to Stockholm, Sweden, where he collected a European Young Investigator (EURYI) Award, presented by the European Science Foundation. Cavalleri is one of 25 recipients of this award, which comes with a grant worth more than \$1.5 million. The EURYI Awards seek to encourage outstanding young researchers from anywhere in the world to work in Europe and lead their own research team. This is the first year that they have been presented. Cavalleri won for his femtosecond time-resolved x-ray studies of critical phenomena in strongly correlated materials. To read a press release, go to http://www.esf.org/esf_pressarea_page.php?language=0§ion=6&year=2004&newsrelease=77 .

8. USERS' MEETING: EARLY REGISTRATION ENDS OCTOBER 1 (Contact: alsum@lbl.gov)

REGISTRATION. Friday, October 1, is the last day to take advantage of the discounted early registration fees of \$150.00 (regular) and \$60.00 (student). After that date, fees rise to \$175.00 and \$75.00, respectively. Registering early also gives Berkeley Lab's Conference Services time to process all the paperwork necessary for visitor security passes at the entrance to the Lab and prevents long lineups at the onsite registration desk. Register now at <http://www-als.lbl.gov/als/usermtg/registration.html> .

AWARDS. The deadline for award nominations recognizing outstanding user service, scientific research, and innovative instrumentation at the ALS has been extended to Thursday, October 7. The

Users' Executive Committee (UEC) invites ALS users and staff to submit nominations for any or all of the awards:

- David A. Shirley Award for Outstanding Scientific Achievement at the Advanced Light Source
- Klaus Halbach Award for Innovative Instrumentation at the Advanced Light Source
- Tim Renner User Services Award

The nominations may be for an individual or a group, and a brief rationale for the nomination(s) is required. Past award winners, along with a representative from the UEC and the ALS, will serve on the award selection committee. To submit a nomination, go to the Award Nominations Web page at <http://www-als.lbl.gov/als/usermtg/nominations.html> .

Agenda and workshops updates and accommodation and general meeting information are all available on the 2004 ALS Users' Meeting Web site at <http://www-als.lbl.gov/als/usermtg/> .

9. REPORT ON OPPORTUNITIES IN TERAHERTZ SCIENCE NOW AVAILABLE (Contact: Michael Martin, MCMartin@lbl.gov)

The region of the electromagnetic spectrum from 0.3 to 20 THz is a frontier area for research in physics, chemistry, biology, medicine, and materials sciences. Sources of high-quality radiation in this area have been scarce, but this gap has recently begun to be filled by a wide range of new technologies. New sources have led to new science in many areas, as scientists become aware of the opportunities for research progress in their fields using THz radiation. A workshop, jointly sponsored by DOE, NSF, and NIH, was held in February 2004 to discuss basic research problems that can be answered using THz radiation. A report on the Workshop on Opportunities in Terahertz (THz) Science is now available at <http://www.sc.doe.gov/bes/reports/abstracts.html#THz> .

10. OPERATIONS UPDATE (Contact: David Richardson, DBRichardson@lbl.gov)

For the user runs scheduled between August 24 and September 26, beam reliability was 93.3%. Of the scheduled beam, 82.7% was delivered to completion without interruption. A failure of the S06 SF2 magnet resulted in the loss of over 20 scheduled hours of user beam time. Correction: In last month's operations data, the numbers for beam reliability and completion were inadvertently transposed; the beam reliability should have been 97.1% and the completion 95.6%.

Long-term and weekly operations schedules are available on the Web at <http://www-als.lbl.gov/als/schedules/index.html> . Requests for special operations use of the "scrubbing" shift should be sent to Jan Pusina (ALS-CR@lbl.gov, x4738) by 1:00 p.m. Friday. The Accelerator Status Hotline at (510) 486-6766 (ext. 6766 from Lab phones) features a recorded message giving up-to-date information on the operational status of the accelerator. A Web page showing the ring status in real time can be found at <http://www-als.lbl.gov/als/status/> .

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http://www-als.lbl.gov/als/als_news/

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Editors: lstamura@lbl.gov, alrobinson@lbl.gov, ejmoxon@lbl.gov

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Current issue online at http://www-als.lbl.gov/als/als_news/

1. PICOSECOND MAGNETIZATION DYNAMICS

by Art Robinson

(Contact: Andreas Scholl, A_Scholl@lbl.gov)

The data rate in modern disk drives will soon surpass 1 GHz. Subnanosecond magnetic-field pulses like those of a write head initiate magnetization precession, a gyroscopic motion of the magnetization around an applied field (like a wobbling top). An ALS - Stanford - Berlin group has used a new time-resolved x-ray photoemission imaging technique to resolve the motion of magnetic vortices, peculiar magnetic structures that appear in micron-size magnetic patterns, in response to an excitation field pulse. Analysis of the observed gyrating trajectory of the core on such short time scales suggests the precession is induced by a handedness or chirality in the magnetization pattern, thereby demonstrating that handedness plays an important role in the dynamics of microscopic magnets.

Read the full story at

http://www-als.lbl.gov/als/science/sci_archive/84magnetization.html

Publication about this research: S.-B. Choe, Y. Acremann, A. Scholl, A. Bauer, A. Doran, J. Stohr, and H.A. Padmore, "Vortex-driven magnetization dynamics," *Science* 304, 420 (2004).

2. SPIN-RESOLVED PHOTOELECTRON SPECTROSCOPY

by Giorgio Turri

(Contact: Nora Berrah, berrah@wmich.edu)

Inner-shell electrons, localized on a single atom, are sensitive site-specific probes of the molecular environment, unlike valence electrons, which can be delocalized over the whole molecule. Binding energies of inner-shell electrons for an atom vary depending on the electron density around that atom modified by the electron-donating and -withdrawing properties of the surrounding atoms. Furthermore, the molecule's geometry can remove the degeneracy of inner-shell electrons, separating them depending on the orientation of their orbitals within the molecule. Such phenomena do not occur in atoms, and hence the investigation of inner-shell photoionization in molecules is considerably more complex. At ALS Beamline 10.0.1, a group of scientists has, for the first time, used spin-resolved photoelectron spectroscopy to study molecular effects on the inner-shell electrons of two simple sulfur-containing molecules, carbonyl sulfide and hydrogen sulfide. The authors show that this technique is very sensitive to molecular environment in the selected cases by comparing with previous atomic results.

Read the full story at
http://www-als.lbl.gov/als/science/sci_archive/87spinresolved.html

Publication about this research: G. Turri, G. Snell, B. Langer, M. Martins, E. Kukk, S.E. Canton, R.C. Bilodeau, N. Cherepkov, J.D. Bozek, A.L. Kilcoyne, and N. Berrah, "Probing the molecular environment using spin-resolved photoelectron spectroscopy," *Phys. Rev. Lett.* **92**, 013001 (2004).

3. NERVE GROWTH FACTOR GETS GOOD RECEPTION

by Bruce Balfour
(Contact: K. Christopher Garcia, kcgarcia@stanford.edu)

In a breakthrough that can now be directly applied to drug design for treating neurodegenerative conditions such as Alzheimer's disease or spinal cord injuries, researchers from Stanford University have discovered a critical step in the mechanism for reproducing nerve growth factor (NGF). One of the most important molecules in the nervous system, nerve growth factor and its other neurotrophin family members control the development of the nervous system in the embryo and the maintenance of nervous tissue and neural transmission in the adult. The researchers used the ALS to obtain the three-dimensional x-ray crystallography structure of a complex of NGF bound to a p75 cell surface receptor, demonstrating the mechanism for receptor activation that has eluded the drug companies for many years.

Read the full story at
http://www-als.lbl.gov/als/science/sci_archive/89receptor.html

Publication about this research: X. He and K.C. Garcia, "Structure of Nerve Growth Factor Complexed with the Shared Neurotrophin Receptor p75," *Science* 304, 870 (2004).

4. USERS' MEETING: RECORD CROWD PUTS BRIGHT FACE ON STORMY WEATHER

by Art Robinson

It's not exactly Russian roulette, but scheduling October events outdoors is not risk-free, even in usually sunny California. An overflow crowd of more than 400 registered users, ALS staff, and vendors enjoyed a full indoor program featuring science highlights and workshops spread over two and a half days starting October 18. However, a major storm, heralding the onset of the San Francisco Bay Area rainy season, posed a few weather challenges for the events on the ALS patio, including a flooded exhibit tent that necessitated an early exit by the 28 vendors (a record number) present on Tuesday morning.

Users' Executive Committee chair Dennis Lindle (Univ. of Nevada, Las Vegas) started the meeting off with a warm welcome to new Berkeley Lab Director Stephen Chu. Coming from a laser-based science background, Chu confessed he was not yet intimately familiar with the ALS but was already hearing that it is one of the best facilities for users to do great science. Acting ALS Director Janos Kirz followed Chu by introducing a surprise guest: Daniel Chemla, who is on extended medical leave from his normal duties as ALS Director while recovering from major surgery.

Janos continued with an overview of the ALS, starting with a nod of appreciation to division deputies Ben Feinberg, Neville Smith, and Jim Krupnick for keeping the facility on track in Daniel's absence and bringing him up to speed soon after his June arrival at the ALS. He emphasized the need for continuous attention to safety in the face of the continuing rapid growth in the user count, summarized several accelerator improvements and new beamlines, and took a look at the future. Coming up in February 2005 is a major Department of Energy (DOE) review of the ALS, which will also include a presentation of the new ALS strategic plan now being constructed based on an

upgrade to higher brightness by means of top-off operation, advanced insertion devices, and specialized beamlines. Janos' talk is available online in PowerPoint (21 MB, <http://www-als.lbl.gov/als/usermtg/kirztalk.ppt>) or PDF (36 MB, http://www-als.lbl.gov/als/usermtg/kirz_talk.pdf) formats.

ALS operation is funded by the DOE Office of Basic Energy Sciences (BES), so the annual "View from Washington" by DOE Associate Director for BES, Pat Dehmer, is always eagerly anticipated. Like Janos, she emphasized the seriousness of safety, calling attention to recent stand downs at other labs that resulted from laser and electrical mishaps and pointedly noted that the same could happen at the ALS. Regarding the budget outlook, fiscal year 2005 is uncertain, as Congress has not finished its actions, and after that there is likely to be pressure on the budget.

Read the full story at
http://www-als.lbl.gov/als/als_news/news_archive/vol.246_102704.html#4

5. OPERATIONS UPDATE

(Contact: David Richardson, DBRichardson@lbl.gov)

For the user runs scheduled between September 28 and October 24, beam reliability was 97.5%. Of the scheduled beam, 94.2% was delivered to completion without interruption. There were no significant outages.

Long-term and weekly operations schedules are available on the Web at <http://www-als.lbl.gov/als/schedules/index.html> . Requests for special operations use of the "scrubbing" shift should be sent to Jan Pusina (ALS-CR@lbl.gov, x4738) by 1:00 p.m. Friday. The Accelerator Status Hotline at (510) 486-6766 (ext. 6766 from Lab phones) features a recorded message giving up-to-date information on the operational status of the accelerator. A Web page showing the ring status in real time can be found at <http://www-als.lbl.gov/als/status/> .

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Current issue online at http://www-als.lbl.gov/als/als_news/

1. SNAPSHOTS OF RIBOZYME REACTION STATES REVEAL STRUCTURAL SWITCH

by Julie McCullough

(Contact: Jennifer Doudna, JDoudna@lbl.gov)

RNA, like protein, can sometimes function as an enzyme (ribozyme) to speed biochemical reaction rates. But how does RNA, a simple polymer with just four different chemical building blocks, enhance reaction rates by at least a million fold? Recently, a group from the University of California, Berkeley, and the Howard Hughes Medical Institute obtained high-resolution x-ray crystallographic structures of a ribozyme trapped in different states of its catalytic cycle, showing how a change in the RNA conformation governs the reaction mechanism. Most ribozymes catalyze the cutting and pasting of RNA molecules at specific sites, snipping out (cleaving) extraneous sequences not needed in the final functional form of an RNA. In the hepatitis delta virus (HDV), a human pathogen with a small circular RNA genome, a ribozyme contained within the viral sequence cuts the RNA at a single site during replication to enable packaging of new virions, the extracellular virus particles that allow the virus to infect a host and replicate. Understanding how the ribozyme works is of interest both for defining the fundamental principles of RNA-catalyzed reactions and for discovering a possible Achilles' heel in this deadly pathogen.

Read the full story at

http://www-als.lbl.gov/als/science/sci_archive/86ribozyme.html

Publication about this research: A. Ke, K. Zhou, F. Ding, J.H. Cate, and J.A. Doudna, "A conformational switch controls hepatitis delta virus ribozyme catalysis," *Nature* **429**, 201 (2004).

2. EXPLOSIVE EXPERIMENT EXPLORES ESCAPING ELECTRONS

by Bruce Balfour

(Contact: Thorsten Weber, weber@hsb.uni-frankfurt.de)

Nothing in the universe stands still. The study of particle motion in molecules allows physicists to probe the fundamental properties of molecules and how they work, which is crucial to understanding the driving forces behind chemistry, biology, and pharmaceutical development. Researchers from Berkeley Lab, Kansas State University, and institutions in Germany, Australia, and Spain used a pulsed beam of photons from the Advanced Light Source to ionize the electrons in a deuterium molecule, causing it to fragment in a "Coulomb explosion." The team then used position and timing data to construct a three-dimensional "photograph" of the simultaneous motion

of all the electrons and nuclei at the moment of fragmentation. In the process, they discovered that even simple molecular hydrogen is full of surprises.

Read the full story at

http://www-als.lbl.gov/als/science/sci_archive/90electron_emission.html

Publication about this research: Th. Weber, A.O. Czasch, O. Jagutzki, A.K. Mueller, V. Mergel, A. Kheifets, E. Rotenberg, G. Meigs, M.H. Prior, S. Daveau, A. Landers, C.L. Cocke, T. Osipov, R. Diez Muino, H. Schmidt-Boecking, and R. Doerner, "Complete Photo-Fragmentation of the Deuterium Molecule," *Nature* 431, 437 (2004).

3. FOUR NEW UEC MEMBERS TO BE CHOSEN BY DECEMBER 15

(Contact: Liz Moxon, EJMoxon@lbl.gov)

The 2004 UEC election is scheduled to begin on Monday, November 29. This year, users will elect four candidates: one student candidate and three regular candidates. To view the final slate and their biographical information, go to <http://www-als.lbl.gov/als/uec/vote/> and click on "View Candidate Biographies." All ALS users with current email addresses on file in our user database are eligible to vote. The deadline for casting your vote is December 15; results should be posted on the election Web site by December 20. The newly elected members will take office for a three-year term beginning January 1, 2005. Rotating off the committee at the end of 2004 are John Bozek (Berkeley Lab), Alexander Moewes (Univ. of Saskatchewan, Canada), Yasuji Muramatsu (Japan Atomic Research Institute), Eli Rotenberg (Berkeley Lab), and Sophie Canton (student member).

4. CALL FOR GENERAL SCIENCES PROPOSALS: DUE JANUARY 5

(Contact: alsproposals@lbl.gov)

The User Services Office is accepting general user proposals from scientists who wish to conduct research in the general sciences at the ALS during the running period from July through December 2005. The deadline for submissions is Wednesday, January 5, 2005. (This deadline does not apply to protein crystallography proposals, which have a separate process and schedule.)

Scientists wishing to renew a previous proposal must download the short "ALS Experiment Report and Request for Beamtime" form (see links below) and email it as an attachment to the User Services Office by the January 5 deadline. The form can be saved to your hard disk, filled out, and attached in an email message to alsproposals@lbl.gov with the key words "Experiment Report" in the subject header. Proposals cannot be renewed for more than three six-month cycles after they are first submitted. After three rollover six-month cycles, a new proposal must be submitted. If your proposal is designated ALS-01062 or lower, then you must submit a new proposal to be eligible for beamtime.

The numeric rating for each proposal will be communicated to the user along with any comments that might have been added by the Proposal Study Panel. The cutoff rating for each beamline in the previous proposal cycle is published on the Web (see Item 5 below). The following resources are available for further information:

ALS User Services Administrator
alsuser@lbl.gov

General user proposal process
<http://www-als.lbl.gov/als/quickguide/independinvest.html>

ALS online forms

<http://alsusweb.lbl.gov/>

ALS Experiment Report and Request for Beamtime

http://www-als.lbl.gov/als/quickguide/experiment_report.doc

Beamline information

http://www-als.lbl.gov/als/als_users_bl/bl_table.html

5. SCORES FOR GENERAL USER PROPOSALS POSTED

User proposals for the general sciences submitted on June 1, 2004, have been reviewed by the Proposal Study Panel (http://www-als.lbl.gov/als/ourorg/proposal_panel.html) and scored on a scale of one (highest) to five. Beamtime for the run cycle January through June 2005 has been allocated based on each proposal's ranking in relation to all other proposals for a given beamline. In cases where proposal requests for a specific beamline exceeded available beamtime, a cutoff score was assigned after which no beamtime was allocated. To view the scoring for all beamlines and the individual beamlines where cutoff scores were applied, see <http://www-als.lbl.gov/als/quickguide/pspscores.html>.

6. SAFETY REMINDER: ENERGIZED ELECTRICAL EQUIPMENT

(Contact: Georgeanna Perdue, GMPerdue@lbl.gov)

Users are reminded that they are expressly not permitted to work on any system with accessible voltages greater than 50 V, as well as high-current (greater than 100 A) systems at lower voltages, and systems with stored energy components greater than 5 J. Such work is defined as "work on energized electrical equipment" and can only be performed by qualified persons under very controlled conditions. Should you require any work on electrical equipment, please contact the electronic maintenance shop at ext. 5457.

7. OPERATIONS UPDATE

(Contact: David Richardson, DBRichardson@lbl.gov)

For the user runs scheduled between October 26 and November 23, beam reliability was 94.9%. Of the scheduled beam, 90.8% was delivered to completion without interruption. Repair of the SR01C QFA power supply resulted in the loss of 13.8 hours of scheduled user beamtime and 7.7 hours of scheduled special operations time.

Long-term and weekly operations schedules are available on the Web at <http://www-als.lbl.gov/als/schedules/index.html>. Requests for special operations use of the "scrubbing" shift should be sent to Jan Pusina (ALS-CR@lbl.gov, x4738) by 1:00 p.m. Friday. The Accelerator Status Hotline at (510) 486-6766 (ext. 6766 from Lab phones) features a recorded message giving up-to-date information on the operational status of the accelerator. A Web page showing the ring status in real time can be found at <http://www-als.lbl.gov/als/status/>.

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http://www-als.lbl.gov/als/als_news/

To subscribe, unsubscribe, or change your delivery address for the email version of ALSNews, send a message indicating your wishes and including your name and email address to alsnews@lbl.gov. We welcome suggestions for topics and content.

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Editors: lstamura@lbl.gov, alrobinson@lbl.gov

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1. MICROSCOPIC MECHANISMS OF MAGNETIZATION

by Bruce Balfour

(Contact: Andreas Scholl, A_Scholl@lbl.gov)

In the ongoing quest for faster and more efficient magnetic data storage, designs for devices such as read heads in computer hard drives are mostly produced through a trial-and-error process, combining thin magnetic films with different properties. To speed up this search, researchers are striving for a better understanding of the microscopic structure and interactions between ferromagnet and antiferromagnet layers. Researchers from the ALS, Stanford University, and Italy have now solved a piece of this puzzle using an x-ray magnetometer at the ALS. They proved that antiferromagnets in contact with ferromagnets form an exchange spring system. An exchange spring combines the maneuverability of magnetically soft materials with the permanence of magnetically hard materials.

Read the full story at

http://www-als.lbl.gov/als/science/sci_archive/91antiferromagnetic.html

Publication about this research: A. Scholl, M. Liberati, E. Arenholz, H. Ohldag, and J. Stohr, "Creation of an antiferromagnetic exchange spring," *Phys. Rev. Lett.* 92, 247201 (2004).

2. STRIPE DOMAINS IN COUPLED MAGNETIC SANDWICHES

by Lori Tamura

(Contact: Z.Q. Qiu, qiu@socrates.berkeley.edu)

Ultrathin magnetic films a few atoms thick occupy a scientific "sweet spot" at the intersection of theory and application. Potentially lucrative as a medium for high-density data storage, such films are also of fundamental interest because of their low dimensionality, enabling scientists to study systems that model two-dimensional magnetic behavior. Nanostructures of several ultrathin magnetic layers can be engineered to explore many interesting phenomena, including the formation of elongated (stripe) magnetization domains. With the ALS's photoemission electron microscope, PEEM-2, researchers from the ALS, UC Berkeley, and China looked at stripe domains in magnetic sandwiches of cobalt, copper, and iron/nickel. The results revealed a hidden universal dependence of the stripe domain width on variables such as film thickness and external magnetic field.

Read the full story at
http://www-als.lbl.gov/als/science/sci_archive/92stripes.html

Publication about this research: Y.Z. Wu, C. Won, A. Scholl, A. Doran, H.W. Zhao, X.F. Jin, and Z.Q. Qiu, "Magnetic stripe domains in coupled magnetic sandwiches," Phys. Rev. Lett. 93, 117205 (2004).

3. ELECTRICAL SAFETY REMINDER (Contact: Georgeanna Perdue, gmperdue@lbl.gov)

All ALS users are reminded that they are expressly **NOT** permitted to work on any energized system with:

- 0-50 volts, if the product of voltage times available current is greater than 500 watts,
- >50 volts, if the available current is greater than 5 milliamperes,
- stored energy above 5 Joules.

Work on equipment with voltages and currents in the above ranges are defined as "work on energized electrical equipment" and can only be performed under very controlled conditions. Users requiring work on electrical equipment that falls into these categories, should contact the Electronic Maintenance Shop at ext. 5457. The staff is available to assist users 24 hours a day.

4. REMINDER: GENERAL USER PROPOSALS DUE JANUARY 5 (Contact: alsproposals@lbl.gov)

The User Services Office is still accepting general user proposals from scientists who wish to conduct research in the general sciences at the ALS during the running period from July through December 2005. The deadline for submissions is Wednesday, January 5, 2005. (This deadline does not apply to protein crystallography proposals, which have a separate process and schedule.) Scientists wishing to renew a previous proposal must download the short "ALS Experiment Report and Request for Beamtime" form (see link below) and email it as an attachment to alsproposals.lbl.gov by the January 5 deadline. Proposals cannot be renewed for more than three six-month cycles after they are first submitted. If your proposal is designated ALS-01062 or lower, then you must submit a new proposal to be eligible for beamtime. The following resources are available for further information:

ALS User Services Administrator
alsuser@lbl.gov

General user proposal process (new proposals only)
<http://www-als.lbl.gov/als/quickguide/independinvest.html>

ALS online forms
<http://alsusweb.lbl.gov/>

ALS Experiment Report and Request for Beamtime (renewals only)
http://www-als.lbl.gov/als/quickguide/experiment_report.doc

Beamline information
http://www-als.lbl.gov/als/als_users_bl/bl_table.html

Proposal Study Panel (PSP) scores
<http://www-als.lbl.gov/als/quickguide/pspscores.html>

5. IN MEMORIAM: DALE SAYERS

Our dear colleague Prof. Dale Edward Sayers (North Carolina State Univ.) died unexpectedly on November 25, 2004. Dale earned his Bachelor's degree from the Univ. of California, Berkeley, and completed his Master's and Ph.D. at the Univ. of Washington. His Ph.D. research centered on the development of a new analytical technique, extended x-ray absorption fine structure, or EXAFS. His first EXAFS paper—written with colleagues Ed Stern and Ferrell Lytle—opened a new field of research that held its twelfth bi-annual meeting in Sweden in 2003. Professor Sayers joined the North Carolina State University physics department faculty in 1976. His main research interest was in applying the EXAFS technique to the study of many systems including amorphous alloys, the semiconductor-metal interface, catalysts, electrochemical systems, environmentally contaminated systems and metalloproteins. Recently, he had been affiliated with a team that discovered and is applying a new x-ray technique called diffraction-enhanced imaging to develop a clinical tool for mammography, osteoarthritis investigations, and bone-density studies. Dale garnered a number of national and international awards, including the Bertram Warren Award (of the American Crystallographic Association), the Centennial Scholar Award (of Case-Western Reserve University), and the Outstanding Achievement Award (of the International XAFS Society). Professor Sayers was also a Fellow of the American Physical Society, and held positions as Visiting Professor/Scientist at several international institutions. In addition, Dale served on the ALS General Sciences Proposal Study Panel for more than five years. Throughout his professional life, Dale's intellect and curiosity benefited a host of scientific colleagues. His personal integrity, humor, and comfortable communication style permeated his life from teaching 18-year-olds to heading world-renowned research teams. He will be dearly missed by his family and his colleagues and friends around the world.

6. ALS AWARDS AND HONORS

The ALS is pleased to acknowledge and congratulate those in its orbit whose achievements have been recognized by their election as Fellows of the American Physical Society (APS):

- Zahid Hussain for major scientific contributions in the physics of materials using synchrotron radiation spectroscopies, and for enabling discoveries by others through the development of cutting-edge instrumentation.
- Rainer Dressler for innovative developments in the study of electron, ion, and photon interactions with molecules and applications to space vehicles.
- Lou Terminello for innovative use of synchrotron radiation spectroscopy in revealing the electronic and atomic structure of new materials.

The APS Fellowship Program was created to recognize members who have made advances in knowledge through original research and publication or made significant and innovative contributions in the application of physics to science and technology. Each year, no more than one-half of one percent of the membership are recognized by their peers for election to the status of Fellow. For more information about the APS and the Fellowship Program, visit the APS Web site at <http://www.aps.org>.

7. UEC ELECTION RESULTS

(Contact: Greg Denbeaux, gdenbeaux@uamail.albany.edu)

The ALS Users' Executive Committee (UEC) welcomes the following four new members next year: Jinghua Guo (Berkeley Lab), Simon Morton (Berkeley Lab), Tony van Buuren (LLNL), and student member Amanda Hudson (UNLV). The newly elected members will take office for a three-year term beginning January 1, 2005. UEC vice-chair Greg Denbeaux (SUNY-Albany) will take over as chair for Dennis Lindle (UNLV), who will serve as an ex-officio UEC member in 2005. Biographical information about the new UEC members is available at <http://www-als.lbl.gov/als/uec/vote/> . Rotating off the committee at the end of 2004 with thanks for their service are John Bozek (Berkeley Lab), Alexander Moewes (Univ. of Saskatchewan, Canada), Yasuji Muramatsu (Japan Atomic Research Institute), Eli Rotenberg (Berkeley Lab), and Sophie Canton (student member).

8. LATEST ACTIVITY REPORT NOW POSTED

(Contact: Lori Tamura, LSTamura@lbl.gov)

A PDF version of the 2003 ALS Activity Report has been posted online (go to <http://www-als.lbl.gov/als/actrep>). The Activity Report is published annually and illustrates the depth and breadth of the ALS scientific program with a selection of research results. The 2003 edition contains a science feature article on nanomagnetism research at the ALS and a retrospective on our tenth anniversary. The report also summarizes operations, ongoing R&D, educational outreach efforts, and special events. Printed copies are being mailed to all users in the ALS database within the next couple of weeks. Others can request a copy by sending email to alsuser@lbl.gov. Be sure to include your name, complete mailing address, and the name of the publication being requested.

9. HOLIDAY CLOSURE SCHEDULE

Berkeley Lab will close on the evening of December 23 and reopen on the morning of January 3. During the closure, the Lab will shut down as much heating and ventilating equipment as possible to reduce costs. (The ALS experiment floor will remain at normal temperature to prevent damage to sensitive equipment.) The first user run of 2004 will be January 5 - 10. The next issue of ALSNews will be published on January 26. Have a safe and happy holiday season, and we'll see you next year!

10. OPERATIONS UPDATE

(Contact: David Richardson, DBRichardson@lbl.gov)

For the user runs scheduled between November 30 and December 19, beam reliability was 98.1%. Of the scheduled beam, 94.3% was delivered to completion without interruption. There were no significant outages.

Long-term and weekly operations schedules are available on the Web at <http://www-als.lbl.gov/als/schedules/index.html> . Requests for special operations use of the "scrubbing" shift should be sent to Jan Pusina (ALS-CR@lbl.gov, x4738) by 1:00 p.m. Friday. The Accelerator Status Hotline at (510) 486-6766 (ext. 6766 from Lab phones) features a recorded message giving up-to-date information on the operational status of the accelerator. A Web page showing the ring status in real time can be found at <http://www-als.lbl.gov/als/status/> .

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Editors: lstamura@lbl.gov, alrobinson@lbl.gov, ejmoxon@lbl.gov

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