NSLS EXAFS Data Collection and Analysis Short-Course "Graduates" 32 Students

June 22-25, 2004

A hands-on EXAFS Data Collection and Analysis Short-Course was held June 22-25, 2004 at the NSLS. The course was co-organized by Bruce Ravel (Naval Research Laboratory) and Simon Bare (UOP LLC), with excellent administrative support by Lisa Tranquada (SFA, Inc.) and Melissa Abramowitz from User Administration.

Thirty-two eager participants (graduate students, postdocs, and institution and industrial scientists), representing universities, national laboratories, research institutes, and industry, attended the four-day course.

Participants in the 2004 NSLS EXAFS course

Among the 32 participants, 15 were new users to the NSLS. The participants had diverse research interests across a broad spectrum of scientific fields, including materials science, geological and environmental sciences, catalysis, and biology.

The four-day course was divided into morning lectures, with two afternoons of hands-on data collection using seven different NSLS spectroscopy beamlines (X9B, X11A, X11B, X18B, X19A, X23B, and X26A), and two afternoons of data analysis. The instructors on the beamlines were Faisal Alamgir, Wolfgang Caliebe, Scott Calvin, Syed Khalid, Tony Lanzirotti, Nebojsa Marinkovic, and Kaumudi Pandya.

The eight morning lectures were: "Introduction to XAFS" and "Basics of sample preparation" by Matt Newville (CARS, University of Chicago), "XANES Measurements and Interpretation" by Simon Bare (UOP LLC), "Detectors and Synchrotron Radiation" by Peter Siddons (BNL), "Basics of Data Processing" by Scott Calvin (Sarah Lawrence College), "A Practical Introduction to Multiple Scattering Theory" by Bruce Ravel (Naval Research Laboratory), "Introduction to Data Analysis" by Shelly Kelly (Argonne National Laboratory), and "Incorporating XAFS into a Research Program" by Vince Harris (Northeastern University). The morning lectures included ample time for stimulating questions and discussion.

For the first two afternoons the participants were divided up into small groups in order to spend time on the NSLS floor at an EXAFS beamline. There, they learned first hand how to collect high quality EXAFS data. Each student became familiar with beamline operation and sample preparation while collecting EXAFS data on representative samples from their own individual research projects. It was fascinating to see the diverse array of samples and projects in which EXAFS was being used.

During the last two afternoons the participants learned EXAFS data analysis techniques using the data they had collected the prior two days. The participants enjoyed informal discussions during coffee breaks, lunches, and the dinners that were included in the course fee.

There was a tremendous amount of information disseminated over the four days. All the participants left the course with new friends and armed with the basic tools to apply x-ray absorption spectroscopy to their own research programs. The organizers thank all those who made the course the great success that it was!

We plan to offer the course again in 2005. Please check the NSLS website for updated information.

The course was sponsored by the NSLS, with support from the Center for Environmental Molecular Science at Stony Brook University.

—Simon Bare

NSLS Visiting Scientist Mehmet Aslantas Wins Prestigious Lecturer Award

July 18-22, 2004

National Synchrotron Light Source visiting scientist Mehmet Aslantas won the prestigious Margaret C. Etter Student Lecturer Award for a talk on his recent work: how to reduce the effects of radiation damage to protein crystals during synchrotron x-ray studies.

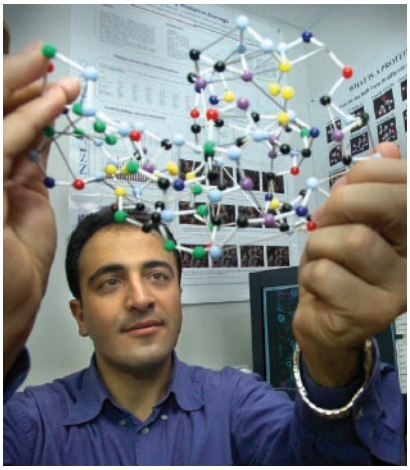
He received the award at the American Crystallographic Association national meeting, held in Chicago, Illinois, on July 18-22, 2004. The Etter award, given out just once a year, recognizes achievement and future potential for scientists at an early stage in their independent careers.

Aslantas, who initially came to the NSLS for six months through a U.S. Department of Energy Cooperative Research program, received an extension that allowed him to stay for over a year. "The NSLS is a great place to work, and I couldn't have completed my research or won this award without the research extension I received," said Aslantas. "I

would like to thank the NSLS Chairman, Steve Dierker, the Associate Chair for User Science, Chi-Chang Kao, Vivian Stojanoff, and the User Administration office for their support."

Aslantas worked under Stojanoff's supervision at NSLS beamlines X6A and X17B1. In his talk, titled "Radiation Effects on Biological Samples," he described his work at the beamlines. At X6A, he studied the effect of low-energy x-rays on 'Lyzozyme' crystals, which are standard test protein crystals. At X17B1, the sample was subjected to high-energy x-rays.

"My experimental results show that, with lower-energy x-rays, the sample absorbs more radiation than at higher energies, in which it absorbs less energy and sustains no significant damage," he said. "This is because the low-energy x-ray beam interacts with the inner shell electrons in the atoms of the protein, causing an overall higher dose to the sample. This leads to structural damage and limits the structural information we can learn about the sample. However the high energy x-rays interact with the outer shell electrons in the atom of the protein. This interaction, known as Compton scattering, plays a role in causing the overall dose deposited to the sample to be less significant. The sample will have a longer life time, too."



Mehmet Aslantas holds a ball-and-stick model of the test protein he used in his research.

Aslantas' work was funded by a U.S. Department of Energy Cooperative Research program, which allowed him to work at the NSLS as part of a scientific exchange program with another synchrotron, SESAME (Synchrotron-light for Experimental Science and Applications in the Middle East). SESAME is under construction.

Aslantas prepared three manuscripts describing his work at the NSLS. His experience will help him form a protein crystallography group at his home institution, Hacettepe University in Ankara, Turkey. In turn, this group will be working with SESAME to develop a protein crystallography beamline at the facility. After his return to Hacettepe University, Aslantas expects to keep in close contact with the NSLS and will continue his research.

—Laura Mgrdichian

Summer Sunday Visitors Battle the Weather for a Great Day at NSLS

August 1, 2004

Despite the rainy, humid weather, NSLS Summer Sunday, held August 1, still pulled in over 450 members of the community and was one of the most enjoyable Sundays yet.

For eight consecutive Sundays each summer, the Brookhaven National Laboratory Summer Sundays program welcomes the public to see the popular Whiz-Bang Science Show and several hands-on science exhibits. Each Sunday also showcases a different BNL facility.

Visitors wishing to see the NSLS began the tour in Berkner Room B, where there were NSLS-specific exhibits and posters, manned by NSLS staff volunteers Steve Ehrlich, Nick Gmur, Payman Mortazavi, Eva Rothman, and Marty Woodle, and student volunteers Meghan Ruppel and Jyoti Tibrewala. The visitors then saw a short "Introduction to the NSLS" overview film before boarding a bus for the facility.

Upon arrival, they went upstairs to see a presentation by an NSLS scientist, who welcomed them and gave more detailed information on the facility and the research performed here. They also discussed how they use synchrotron light to perform their individual research. Many guests were very curious about the NSLS, and the speakers answered several questions. This year's speakers were Marc Allaire, Elaine DiMasi, Tony Lanzirotti, Lisa Miller, Peter Siddons, and Vivian Stojanoff.

Visitors then filed down to the NSLS lobby and patio, where more activities awaited them, such as the "What am I looking at?" picture window that provides an impressive view of the VUV-IR experimental floor, a sight that is always fascinating for guests. NSLS staff members Steve Bennett, Mike Buckley, Susila Ramamoorthy, and Larry Fareria explained the view and answered questions, such as the common query, "What's the aluminum foil

Student volunteer Angela Padilla shows a group of young Sunday visitors how to build a protein crystal model from gumdrops.

for?" This year, for the first time, large neon numbers were placed on beamline components, which made it easier for guests to see the features described to them.

NSLS scientist Zhong Zhong (right) shows several Summer Sunday guests how a monochromator divides visible light into a rainbow of colors.

The lobby also contained several exhibits, such as "See the Light," in which volunteers Randy Smith and Ted Feldman showed how a fiber optic cable siphoned actual NSLS light into the lobby, and "Flowing Lasers," in which Tom Dickinson and Raji Sundaramoorthy made a laser beam "flow" down a stream of water. The children watched the laser light fill the water and sparkle when they put their hands under the stream. Other displays were hosted by additional NSLS scientists, staff, and students: Peter Abbamonte, Marc Allaire, Alec Bernston, Brandon Chapman, Ed Haas, Amubhav Jain, Payman Mortazavi, Angela Padilla, Vivian Stojanoff, Tejas Telivala, Adele Wang, and Zhong Zhong.

On the patio, the visitors saw how superconductivity can "levitate" a magnet and how boiling liquid nitrogen sends a sprinkler spinning. Scientists Wolfgang Caliebe and Cecilia Sanchez-Hanke kept watch over the outdoor activities.

A fun, new event this year was the quiz/raffle, which turned out to be quite successful. Each visitor received a yellow quiz card with questions, which could only be answered by visiting each exhibit. This encouraged them to stop at each one and also made the day more interactive. Every 20 minutes, the quiz cards were collected and Gerry Van Derlaske, the enthusiastic quiz/raffle MC, picked a winning name. Each winner received an NSLS flashlight.

Additionally, at several points during the day, Caliebe braved the rain to launch a giant water rocket in the parking lot across from the NSLS – a hit with all the guests.

The day was made possible by several additional volunteers, who served as tour guides, escorts, and support personnel: Melissa Abramowitz, Diane Hatton, Madeline Hughes, Laura Mgrdichian, Eileen Morello, Wendy Morrin, Gina Paveglio, Lydia Rogers, Nancye Wright, and Emil Zitvogel.

—Laura Mgrdichian

Summer Student Research at the NSLS

August 10, 2004

Each summer, many high school and college students perform summer research projects at Brookhaven National Laboratory. Many of the students work at the NSLS, teaming up with an NSLS scientist, as part of Laboratory-sponsored research internship programs.

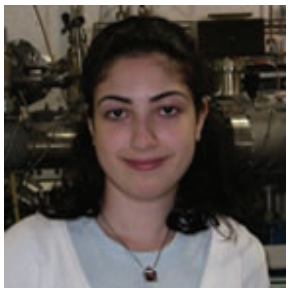
The students work with scientists and engineers in a wide range of research fields, including medical sciences, geology and environmental sciences, chemistry, materials science, physics, and electrical and mechanical engineering. In addition to their research projects, students have the opportunity to attend scientific lectures, tour Brookhaven research facilities, and participate in numerous social activities.

The following are summaries of programs that NSLS summer students participated in, and short profiles of some of the students that performed research here this summer.

Community Summer Science Program (CSSP)

This program invites high school students who have completed their junior or senior year to come to BNL for a six-week period, where they attend morning lectures and demonstrations by BNL scientists, workshops, and afternoon internships. Volunteer BNL mentors guide the interns in individual research projects.

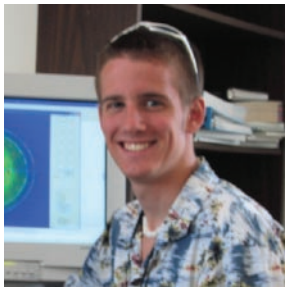
Michael Dibiccari, a junior at Hauppauge High School, worked at beamline X22B with Elaine DiMasi as part CSSP. After growing mineral crystals, he studied the x-ray diffraction patterns they created in order to determine how the crystals formed. This research will help scientists understand the process of biomineralization.



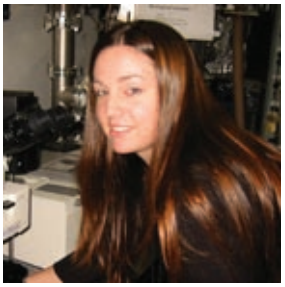
Dina Halajian is a senior a Half Hollow Hills High School East. Participating in CSSP, she also worked with NSLS scientist Elaine DiMasi. They investigated the growth process of minerals by growing calcium crystals and studying them at beamline X22B with a microscope. Their results will add to the field of biomineralization.

Science Undergraduate Laboratory Internships (SULI)

The SULI program is sponsored by the U.S. Department of Energy (DOE), and offers internships for college students in the spring, summer, and fall terms. Participants are paired with a member of the BNL staff to perform a research project in chemistry, physics, engineering, biology, nuclear medicine, applied mathematics, particle accelerators, or science writing.



Alec Bernston is a sophomore at Cornell University, where he studies computer science. This summer, in the SULI program with NSLS mentor Vivian Stojanoff, he participated in the development of a software package for protein crystallography diffraction analysis. The software will help speed up the diffraction process.



Meghan Ruppel is a senior at Stony Brook University, and will soon earn her degree in Materials Science and Engineering. In the SULI program, she worked with Lisa Miller at beamline U10B, using infrared light to study the chemical composition of bone and calcified cartilage in osteoarthritis. This work will help them understand how the makeup of bone in knee joints plays a role in cartilage breakdown.

Ted Feldman is a sophomore at Stony Brook University. As part of Stony Brook's Interdisciplinary Biomedical Research Program, Ted worked with Lisa Miller to study the chemical and mechanical properties of bone that has been mineralized. This work will help increase scientists' understanding of bone quality, which may help predict osteoarthritis.

Jyoti Tibrewala is a graduating senior at MIT and this summer she worked with Lisa Miller as a SULI participant. They studied the effects of pressure on the chemical composition of bone mineral using infrared spectroscopy at beamine U2A. Their results will help explain bone loss in post-flight astronauts and osteoporosis patients.

Anubhav Jain, a SULI participant, worked with Vivian Stojanoff, designing computer software that will automatically position crystal samples in the path of an x-ray beam for diffraction studies. This task is currently done manually by researchers – thus, this new software will decrease the time needed to collect data and allow the researchers to solve more crystal structures in less time.

Also involved in research at the NSLS this summer were SULI participants Patrick Lynch (Bucknell University) and Matthew Teng (Cornell University), who worked with NSLS mentors John Skaritka and Zhong Zhong, respectively. Lynch worked on a "Mechanical Design of a Five-Meter Superconducting Undulator" and Teng's project was titled "Use of Diffraction Enhanced Imaging to Determine Refractive Indices of Various Tissues at Select Energies."

Pre-Service Teacher program (PST)

In this program, a collaboration with the National Science Foundation and sponsored by the DOE Office of Science, teachers in training are paired with scientist mentors and a professional teacher, and immersed in a research environment. The pre-teachers perform scientific research, which helps them learn how to better explain scientific concepts in a classroom environment.

Participating in PST, Angela Padilla worked with Vivian Stojanoff to study samples from a native American 17th century artifact, using different spectroscopy and diffraction techniques. Their research may help anthropologists understand the social and economic relationships between native Americans.

Faculty and Student Teams (FaST)

The FaST program pairs a student/professor team from a university or college with limited research capabilities with a BNL scientist. For 10 weeks, the faculty/student team performs research they cannot do at their home institution, which not only helps the BNL researcher, but also gives the team experience while building a relationship between the institution and BNL.

At the NSLS, FaST program summer visitors from Southern University in Louisiana were faculty member Elhag Shaban and students Clifford Williams and Shayla Wilkinson. They worked with NSLS scientist Peter Siddons on new electron multiplier structures for synchrotron x-ray detector systems.

—Laura Mgrdichian

Parney Albright, DHS, Visits BNL

August 27, 2004

Parney Albright, Assistant Secretary of Homeland Security, Science & Technology Division of the Department of Homeland Security, came to BNL on August 27. After a welcome by BNL Director Praveen Chaudhari, Interim Deputy Director for Science & Technology Peter Bond, Brookhaven Site Office Manager Michael Holland, and Associate Laboratory Director for Energy, Environment & National Security Ralph James, Albright and his executive assistant Leslie Stone toured facilities and met with several scientists over lunch.

During a visit to the Radiation Detector Testing & Evaluation Center, James discussed portal monitors and hand-held monitoring devices and the results of BNL's

At BNL's Radiation Detector Testing & Evaluation Center are: (from left) Leslie Stone, Department of Homeland Security (DHS); Peter Bond, BNL; Ralph James, BNL; Parney Albright, DHS; and Joseph Indusi, BNL.

testing and evaluation of commercial, off-the-shelf radiation detectors for homeland security applications.

In touring the Instrumentation Division, the party learned about BNL's advanced detectors: Peter Vanier, Instrumentation, described the xenon gamma detector; Creighton Wirick, Department of Environmental Sciences (ES) Chair, spoke on the standoff detection capabilities of the Raman Mini-LIDAR chemical and biological sensor system; and Graham Smith, Instrumentation, explained how advanced neutron detectors and low-noise electronics for nuclear spectroscopy and imaging can be used to further national security.

A visit to the National Synchrotron Light Source (NSLS) was also on the agenda. NSLS scientist Peter Siddons gave an overview of the wide range of research in biology and physics, chemistry and geophysics, materials science and medicine, performed by Lab scientists and some 2,200 researchers from the U.S. and overseas at this facility. Aleksey Bolotnikov of the Nonproliferation & National Security Department discussed the expectations made possible by another kind of radiation detector utilizing cadmium zinc telluride crystals.

At the Lab's Relativistic Heavy Ion Collider (RHIC), the visitors saw another example of how basic research results in breakthrough detector capabilities. Tim Hallman of the Physics Department described the RHIC program and the giant STAR detector, conceived and developed with three other detectors to track instantaneously thousands of subatomic particles formed when two beams of heavy ions are crashed together at nearly the speed of light, to recreate and reveal what happened in the earliest stages of the universe.

In the environmental sciences area, Albright learned about BNL's contribution to the urban dispersion program and work on consequence management for radiological dispersal devices, topics discussed by Michael Reynolds, and Paul Kalb and Jeff Gillow, all of ES, respectively. The Lab's forefront research in areas involving biological security was represented by John Dunn of the Biology Department, who displayed real-time DNA sequencing for agricultural-biological terrorism counter measures, and Subramanyam Swaminathan, also of Biology, who described his work on ultra-sensitive assays for botulinum toxins.

— Liz Seubert

Awards and Good Times at the 2004 NSLS Barbeque

September 24, 2004

On September 24, a crowd of National Synchrotron Light Source staff members joined the recipients of the 2004 Spotlight and Service awards to celebrate the winners' careers and accomplishments, and to enjoy food, drinks, and the early autumn weather. NSLS Chairman Steve Dierker led the ceremony.

NSLS Chairman Steve Dierker

Service Awards

This year, the following staff members were honored with 25 years of service: Steve Bennett, Rich Biscardi, Conrad Foerster, Tony Lenhard, Bill Newburgh, Gary Ninztel, Stefan Palo, Sal Pjerov, Susila Ramamoorthy, Bob Scheuerer, and Jiunn-ming Wang.

Receiving the 20-year service awards were Bob Best, Pete Ratzke, Ray Raynis, and John Skaritka, and Qing-yi Dong received the 10-year award.

Spotlight Awards

The Spotlight awards, which commend deserving NSLS staff members for exceptional performance during the year, were presented to Laura Miller, recommended by Steve Dierker; Bob Best and Tony Santiago, both recommended by John Gallagher; and two groups (each group shares one award). The first group, nominated by Steve Hulbert, was Dennis Carlson, Michael Caruso, Shu Cheung, Rick Greene, Tony Lenhard, and Gary Nintzel. The second, nominated by Ed Haas, was Walter deBoer, Mike Radulescu, and Bob Scheuerer.

Bob Best: Bob received his award for building, testing, and

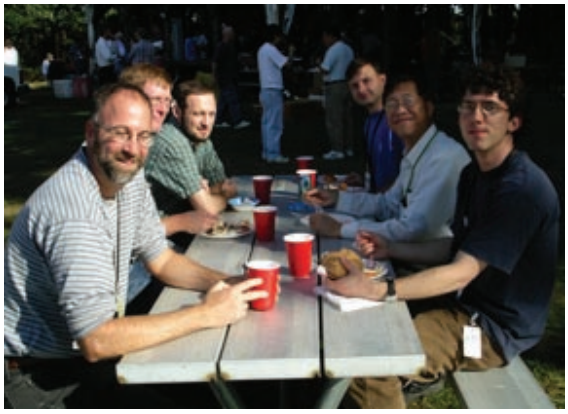
From left: Rodger Hubbard, Bob Best, Don Davis, Jim Newburgh, and Bob Scheuerer.

debugging the laser interlock/controllers system at beamline X17B3. This required extensive planning and coordination between the other electricians at the NSLS. If not for Bob's hard work, one of two costly alternatives to controlling the inner cavity shutter at the beamline would have been explored, resulting in long delays to the program at X17B3.

Tony Santiago: Tony was honored for modifying the Source Development Laboratory's (SDL) laser interlock system, a task that required extensive electrical work and rearrangment. With direction from Scott Buda and John Gallagher, he worked through breaks, lunches, and put in overtime to complete the project, and managed to do so without impacting the operations of the SDL.

Laura Miller: Presented as a surprise, Laura received this award for organizing and planning many of the details of the NSLS-II Workshop. Her hard work, involving extended hours and even weekends, helped to make the workshop incredibly successful. In turn, this success is vital to helping ensure that NSLS-II becomes a reality.

Dennis Carlson, Michael Caruso, Shu Cheung, Rick Greene, Tony Lenhard, and Gary Nintzel: This group was recognized for their exceptional service to the NSLS during the May 2004 shutdown. During this time, three major beamline upgrades were performed *in addition* to the increased beamline maintenance during that period. At X21, the largest of the upgrades, where two nested wiggler beamlines had to be fabricated and installed, the group performed much of this work during the shutdown, and faced several problems that popped up during the process. At the same time, they worked on the upgrades at X13A and X1A1, which both required unexpected work.



Clockwise, from left: Michael Appel, Jim Rose, Timur Shaftan, Alexei Blednykh, Li-Hua Yu, and Randy Smith.

Walter deBoer, Mike Radulescu, and Bob Scheuerer: Just before the NSLS May shutdown, a vacuum leak was found in the x-ray ring that worsened until x-ray operations were significantly affected. Walter, Mike, and Bob successful dealt with the problem and the intricate details surrounding it without impacting the x-ray schedule. Walter repeatedly came in after hours and on short notice to temporarily fix the leak. His repairs allowed operations to continue until he could properly fix the problem. From start to finish, Walter performed above and beyond the call of duty.

The leak forced the spring shutdown schedule to be changed, demanded that new work plans be reviewed and approved rapidly, required new hardware to be ordered, and necessitated the location, check, and approval of new fixtures. These details required coordinating many parties across varying time frames. Bob proved instrumental in making it happen.

Mike was the chief technician who performed the repair; he worked flawlessly and quickly, and put in long hours to complete it. His excellent, efficient work helped result in the quick-fix of a complex repair job – finished ahead of schedule with no significant errors.

—Laura Mgrdichian

The Hill Comes to the Lab

Energy & Water Development Appropriations Subcommittee personnel visit BNL

October 26, 2004

Visiting the Lab on Tuesday, October 26, were Kevin Cook, Majority Clerk of the Energy & Water Development Appropriations Subcommittee (EWDAS) and Dixon Butler, EWDAS Minority Professional Staff Member. Welcomed by BNL Director Praveen Chaudhari, DOE Brookhaven Site Office Manager Michael Holland, Deputy BNL Director for Operations Michael Bebon, and Assistant Lab Director for Community, Education, Government & Public Affairs Marge Lynch, the visitors, with Jack Bagley of Battelle's Washington Office, toured selected facilities to see more of BNL's research

Standing near the viewing window in the NSLS lobby are Brookhaven Lab Director Praveen Chaudhari; Steve Dierker, NSLS Chairman and Associate Laboratory Director for Light Sources; Kevin Cook, Majority Clerk of the Energy & Water Development Appropriations Subcommittee (EWDAS); and Dixon Butler, EWDAS Minority Professional Staff Member. Elaine Lowenstein, of Brookhaven's Community Relations group (foreground), led the group on a tour of the facility.

capabilities and learn about site infrastructure.

At the National Synchrotron Light Source (NSLS), which draws annually more than 2,200 researchers from the U.S. and overseas to join Lab scientists in studying physics, chemistry, materials science, biochemistry, geophysics, and medicine, Associate Laboratory Director for Light Sources and NSLS Chair Steve Dierker gave an overview of the facility and plans for its upgrade as well as for the proposed NSLS-II. Doon Gibbs, Associate Laboratory Director for Basic Energy Sciences, and Robert Hwang, Director of the Center for Functional Nanomaterials, discussed BNL's thriving nanoscience program.

The STAR detector at BNL's Relativistic Heavy Ion Collider (RHIC) provided another stop on the agenda. Derek Lowenstein, Collider-Accelerator Department Chair, and STAR spokesperson Timothy Hallman of the Physics Department described the RHIC facility and explained some of the physics being explored there. At RHIC, more than 1,000 researchers are working on four experimental teams to recreate and analyze conditions believed to have occurred during the earliest stages of the universe.

On a tour to look at site infrastructure, Bebon showed the visitors the recent improvements to the Materials Sciences Department in Building 480 and talked about near- and long-term plans being made for the needs of various areas of the Lab.

Lowenstein, with Betsy Sutherland of the Biology Department, outlined the National Aeronautics & Space Administration (NASA) and BNL research on the possible risks to humans exposed to space radiation. These studies, which use proton and ion beams that simulate the cosmic rays found in space, are done at the NASA Space Radiation Laboratory, known as the NSRL, operational at BNL since July 2003.

Another high-profile BNL initiative, medical imaging, was the focus of a stop at the Positron Emission Tomography (PET) facility. There, Helene Benveniste, who, at the time, was the Associate Laboratory Director for Life Sciences, and PET Program Director Joanna Fowler, Chemistry Department, described the Lab's pioneering work in probing the brain chemistry of addiction, mental illness, and aging, and other recent work to find effective treatments and on imaging awake animals.

—Liz Seubert

Remembering Dale Sayers

November 25, 2004

On November 25, 2004, Dale Sayers, a founder of the extended x-ray absorption fine structure (EXAFS) technique and a prominent NSLS user and advisor, passed away from complications due to a heart attack. He was 60 years old. He is remembered for his immense impact on NSLS science and operations, and his commitment to the field of synchrotron science.

Dale Sayers

Dale's part in developing EXAFS began in 1968 when he was a graduate student at the University of Washington. He was a student of Edward Stern, a UW faculty member and a consultant for the Boeing Scientific Research Laboratories (BSRL) in Seattle. Stern knew BSRL researcher Farrel Lytle and learned of his work on what would be the early theory of EXAFS. He decided that further work on the subject would be a good thesis project for Dale.

Dale began working with Lytle at his laboratory, measuring the EXAFS of various materials. By the end of the 1970 spring semester, the major parts of the theory were established, but one task was left: determining how to obtain structural information from the EXAFS equation they had formulated. The three decided that inverting the equation would be the way, and, in 1971, Dale tried applying the Fourier integral theorem to the equation. Success!

In a 1999 Journal of Synchrotron Radiation paper, Lytle wrote, "In a defining moment, I can still visualize Dale's excitement as he ran down the hall to greet me with the first plot of the first Fourier transform of the EXAFS function

From left, Edward Stern, Dale Sayers, and Farrel Lytle accept the American Crystallographic Association's Bertram Warren Award in 1979, for their development of EXAFS.

of germanium!" The EXAFS technique is now used at every synchrotron across the globe.

During his time as a NSLS user, beginning in the early days of the facility, Dale was a physicist with the North Carolina State University (NCSU) but spent a great deal of time here. He was the chair of the NSLS Users Executive Committee in the early 1980's, at a time when the NSLS was an "unrefined" scientific workplace, and often a difficult environment in which to perform research. Dale established trust between the NSLS and the user community, culminating in an excellent users' meeting in 1985 that included an especially memorable dinner event. He also chaired the UEC in 1987 and '88.

Dale's work at the NSLS led him to establish and operate beamline X11A. Under his leadership, X11A has been one of the most scientifically productive beamlines at the NSLS. He established a participating research team (PRT) at X11 (the longest-lived PRT beamline) and was its spokesperson from 1983 until 2001.

In the 1990's, Dale initiated a mammography project at the NSLS, working with former NSLS staff physicists Bill Thomlinson and Dean Chapman, and current NSLS physicist Zhong Zhong. The project led to the development of diffraction-enhanced imaging (DEI), a technique now used around the world to image bone and soft tissue in a way not possible using conventional x-rays. Dale became the co-spokesperson for beamline X15A after a dedicated DEI system was established there in 1998. He was leading efforts to apply DEI to a clinical setting and, for the past few years, had been working with graduate students Dean Connor and Miklos Kiss to characterize bone and reconstruct DEI images using computerized tomography (CT).

While Dale was renowned internationally for his research, his influence extended far beyond raw science. Astute and determined, he was committed to the successful operation of synchrotron facilities and the success of the field of synchrotron radiation research. This led him to become a trusted advisor to many facilities, and he sat on many scientific advisory committees.

Dale was known as a tough, yet fair, advisor, but his personal experiences were filled with laughter and frequent interactions with family, friends, and colleagues. He enjoyed traveling abroad with his wife, Anne, and did so often.

Dale earned his bachelor's degree from the University of California at Berkeley, his master's and Ph.D. degrees at the University of Washington, and then joined the NCSU physics department in 1976. He received many awards over the course of his career, including the American Crystallographic Association's Bertram Warren Award, Case Western Reserve University's Centennial Scholar Award, and the Outstanding Achievement Award of the International XAFS Society.

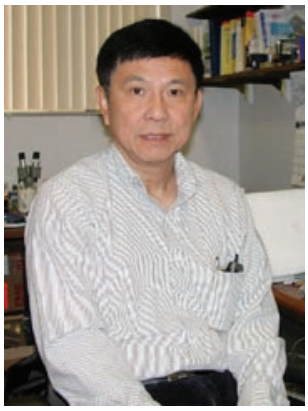
—Laura Mgrdichian

Contributors: Bill Thomlinson, Zhong Zhong, and Kumi Pandya

The Gregori Aminoff Prize Goes to Prominent NSLS User David Mao

December 1, 2004

David Mao, a frequent NSLS user, was awarded the 2005 Gregori Aminoff Prize in Crystallography by the Royal Swedish Academy of Sciences. Mao received this prestigious award "for pioneering research of materials at ultrahigh pressures and temperatures."



David Mao

"I am very honored to receive this award for my work using high-pressure diamond anvil cell devices," said Mao, a researcher with the Geophysical Laboratory at the Carnegie Institution of Washington. "We are at the exciting moment when high-pressure research may emerge as a major branch of modern science. Groundbreaking high-pressure experiments reveal numerous new phenomena of revolutionary importance for a wide range of problems in the physical sciences. Fortunately, with modern

synchrotron light sources, these phenomena can be directly probed and studied at extreme pressure conditions."

He continued, "There are so many colleagues at the Geophysical Laboratory to whom I am in debt for this development, particularly Larry Finger and Charlie Prewitt, from whom I learned structural crystallography; and Bill Bassett, Peter Bell, and Rus Hemley, who I joined in developing this new high-pressure field. I must also thank Chi-Chang Kao at the NSLS, who taught me how to study electron and phonon dynamics of crystals by inelastic x-ray scattering spectroscopy."

The Aminoff prize is given out annually to scientists or research groups (of three people or fewer) who have made a major contribution to the field of crystallography. It consists of a gold medal, a diploma, and a $10,000 cash award, and is named after Swedish crystallographer Gregori Aminoff, the first scientist to introduce crystallography to Sweden.

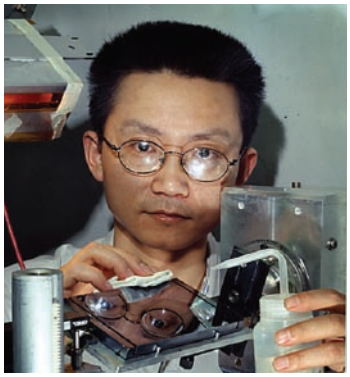
Mao will formally accept the prize from His Majesty King Carl XVI Gustaf, the king of Sweden, at the Royal Swedish Academy's annual meeting, to be held June 8, 2005. Following the ceremony, Mao will present a lecture on his work.

—Laura Mgrdichian

Zhong Zhong Explains Diffraction Enhanced Imaging at the 399th Brookhaven Lecture

December 15, 2004

To look below the surface of the human body in search of deep-seated injury or disease, today's radiologists use an alphabet-soup of imaging techniques: computerized tomography, or CT; magnetic resonance imaging, or MRI; positron emission tomography, or PET; single photon emission computed tomography, or SPECT; whole body scanners; and ultrasound.



Zhong Zhong

Despite the advancements in non-invasive medical imaging, 80 percent of radiology still involves the well-known x-ray. But x-ray imaging technology has not changed very much over the past 100-plus years, mostly showing bone much more clearly than soft tissue, such as ligaments, cartilage, or blood vessels.

Now, thanks to researchers working at BNL, x-rays from the National Synchrotron Light Source (NSLS) are being employed in a new, low-dose experimental technique to visualize not only bone, but also soft tissue, in a way that is not possible using conventional x-rays. Called diffraction enhanced imaging (DEI), the technique provides all the information provided by conventional x-rays, plus additional data on soft tissues that were previously accessible only using alternative methods such as MRI or ultrasound.

Zhong Zhong, a physicist at the NSLS and the co-inventor of DEI, has been developing the technique for nine years. He discussed the imaging technique at the 399th Brookhaven Lecture, "Diffraction Enhanced Imaging: Seeing X-Rays as One Sees the Light," at 4 p.m. on Wednesday, December 15, 2004 in Berkner Hall. Zhong was introduced by Steve Dierker, NSLS Chair and Associate Laboratory Director for Light Sources.

Zhong is currently responsible for the DEI program and the high-energy x-ray scattering facility at NSLS beamlines X15A and X17B1, respectively.

Zhong earned his B.S. in physics from Beijing University, China, in 1990; received an M.S. in applied physics from Michigan Technological University in 1992; and, in 1996, received his Ph.D. in physics from Stony Brook University.

—Laura Mgrdichian