THE 1996 NSLS ANNUAL USERS' MEETING

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The NSLS users held their 1996 Users' Meeting on May 21st, 1996 at Brookhaven National Laboratory, where they had an opportunity to celebrate another year of scientific and technical achievement, to welcome Michael Hart as the new NSLS Chairman, to hear the latest news about Department of Energy support for its scientific facilities, and to visit once again with old friends.

Keynote Speaker Malcolm Browne,
Senior Science Writer of the New York Times.

Three workshops on various scientific and technical subjects met on May 20, and three more on the 22nd. The workshops have continued to grow as an important part of the annual get-together; of the 368 people who registered for any part of the meeting, 80% attended a workshop.

The user community saw the vision for the future held by the new NSLS Chairman, Michael Hart. Reminding his audience that the NSLS operates with the high-brightness Chasman-Green lattice, he noted that the opening of third-generation synchrotron radiation sources in Europe (ESRF and Elettra) has not reduced the demand nor the productivity of second generation facilities, such as the NSLS. Since many experiments are limited by such factors as flux, detector capability, and source stability, they will not necessarily be improved by the newer accelerators, and the NSLS can expect to play an important scientific role in the foreseeable future. Many of these points are discussed in the recently released white paper, "NSLS Into The 21st Century."

Hart also told the users that he has reactivated the NSLS Science Advisory Committee, and has instructed it to initiate the process of tenure review for each beamline. He pointed out that the mission of many of the PRTs has changed substantially since they were created, and that the PRT system does not necessarily provide the best-supported access for all users. The NSLS is working to broaden the access available to the user community for such popular measurement techniques as EXAFS, powder diffraction, and reflectivity.

William Oosterhuis of the Department of Energy described the Scientific Facilities Initiative within the Office of Basic Energy Sciences. In the present fiscal year, $57 million was made available to the DOE programs at twelve facilities. This gave the NSLS a $5 million increase in funding, its first real increase in five years. Consequently, the NSLS has increased its beamline support staff by 20%, and made significant upgrades to the injection system, water supply, computer controls, and the accelerators themselves. Oosterhuis congratulated the user community in communicating the importance of the SFI to Congress. He indicated that the SFI is in the President's FY1997 budget (although 2% less than this year) so that we can expect to continue activities started this year.

(From Left to right) Uli Hillebrecht (University of Dusseldorf), Franz Himpsel (U. Wisconsin, Madison), Steve Hulbert and Xilin Wu (NSLS, Brookhaven National Laboratory).

The keynote speaker was Malcolm Browne, Pulitzer Prize-winning Senior Science Writer of The New York Times. His talk, entitled "Lamplighters and Tool Makers," described two complementary modes of scientific progress: the abrupt discovery and the methodical advancement of new knowledge. He drew a number of interesting conclusions about the role of science and technology in society.

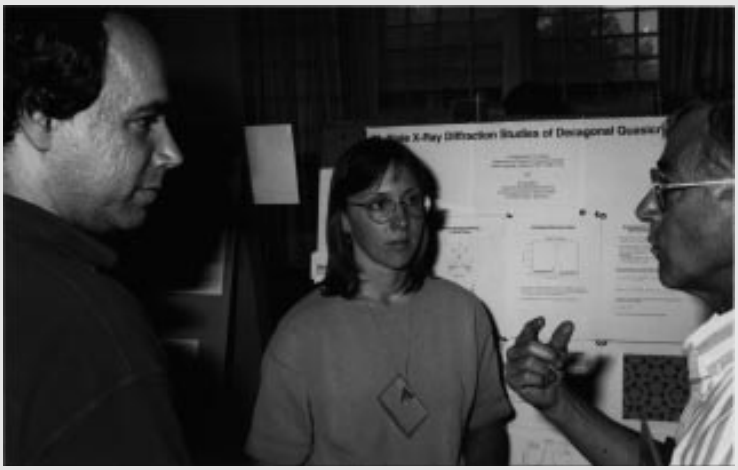
The talks about scientific topics began with Stephen Harrison of Harvard University and the Howard Hughes Medical Institute. He spoke about the role of protein crystallography in understanding how genes are switched on and off in the cell. He described his group's work on the transcription factor NF-*B, specifically on the complex of one protein dimer with a strand of DNA. This work, performed at beamlines X4A and X25, used the multiple wavelength anomalous diffraction (MAD) technique for solving the structure. It is also highlighted in a report entitled "Structural Biology Research at the NSLS" (BNL Informal Report 62916, May 1996).

Peter Siddons of the NSLS spoke about precision machining of plastic (PMMA photoresist) using hard x-rays. The NSLS group concentrates on making three-dimensional parts, in contrast with the rest of the world's micromachining efforts, which are mostly on thin, planar structures. Among other points, he described the serendipitous discovery of a technique for making re-entrant cavities, illustrated with a tiny hexagonal wine glass. The ultimate goal is to develop these techniques to the point where they could be economically feasible on a production-line basis rather than a technical curiosity.

The next talk moved to a different part of the electromagnetic spectrum — the use of infrared radiation to elucidate high-temperature superconductivity. Dmitrii Basov of the Brookhaven Physics Department spoke about three regimes that are observed in layered cuprates as a function of oxygen concentration: insulating, "conventional" superconductivity with a gap (range of frequencies with zero conductivity), and a pseudo-gap state in which the infrared conductivity is suppressed but nonzero. In these materials, the pseudo-gap occurs at rather high temperature, and grows deeper as the temperature is lowered, with no abrupt change at the superconducting transition.

Gary Prinz of the Naval Research Laboratory spoke about magnetoelectronic devices, in particular about the role of synchrotron radiation in their development. Rapid progress in this field is leading to significant applications in sensors, memories, and logic elements. These can only be pursued with the detailed understanding of the magnetism of electronic states, especially at surfaces and interfaces, which comes from elegant ultraviolet spin-resolved photoemission and magnetic circular dichroism experiments.

Peter Stephens (SUNY @ Stony Brook), and D. Peter Siddons (Brookhaven National Laboratory, NSLS).



At the Poster Session: (From left to right) Steven Ehrlich (Purdue University), Rachel Eisenhower (University of Illinois @ Urbana-Champagne), and Bill Thomlinson (NSLS Associate Chairman for Environment, Safety and Health/User Programs).

John Fulton of the Pacific Northwest Laboratories discussed recent work on ion solvation in supercritical water. This has been suggested as an attractive method for cleaning and disposing of hazardous materials, and it is important to have a detailed understanding of the fundamental differences between usual solution chemistry and solutions in supercritical water. *In situ* EXAFS experiments are able to reveal such information as the fact that Sr^{2+} is coordinated by half the number of water molecules in supercritical water than at standard temperature and pressure. These experiments also have significant relevance to catalysis and to geochemistry.

Polymer diffraction patterns usually have relatively few, broad peaks, whereas one normally associates synchrotron-based powder diffraction with a high resolution technique. Nevertheless, DuPont scientist Kenn Gardner described several significant advantages to the use of synchrotron radiation for his work in polymer crystallography. Particularly important is the fact that the lineshape is accurately known, whereas laboratory measurements need good standards (which do not exist), e.g., to distinguish paracrystalline disorder from finite-size broadening for low angle peaks.

Erik Johnson of the NSLS concluded the series of scientific talks with the tantalizing question, "Could you Use a Couple of Orders of Magnitude?" He proposes to deliver that improvement in the intensity of pulsed ultraviolet and infrared light at the Source Development Laboratory. This is a broadly-based project of research and development on an ultraviolet free electron laser amplifier and on the use of very short electron bunches for FEL and coherent synchrotron radiation experiments.

Two other important features of the Users' Meeting were the scientific poster session, with a reception at the Brookhaven Center, and the equipment show in the Berkner Hall lobby. Both were popular opportunities to sniff out some of the latest work at the facility, and to see the exciting new tools and ideas for synchrotron radiation research.

By way of administrative business, the NSLS Users' Association elected three new general members to the Users' Executive Committee: Joel Brock of Cornell University, Ian Robinson of the University of Illinois, and Thomas Russell of the University of Massachusetts. It also approved a charter revision so that future Special Interest Group elections will be held by electronic mail, and approved a new SPIG for industrial users. In executive session, the UEC chose Brock to be its Chairman-elect.

At the Equipment Show/Vendor Exhibit: (From left to right) Andrew J. Howard (Illinois Institute of Technology), Chris Nielson and Ronald C. Hamlin (Area Detector Systems, Inc.).