

**Participation by Industrial Users in Research
at National User Facilities:
Status, Issues, and Recommendations**

Preliminary Report

Prepared as a summary of a June 11, 2009, industrial usage workshop
conducted under the auspices of the
National User Facility Organization (NUFO)
at
Argonne National Laboratory

August 3, 2009

Report prepared by the Workshop Organizing Committee
and the National User Facility Steering Committee

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The workshop organizers and NUFO Steering Committee are grateful for the support provided by Argonne National Laboratory and the Advanced Photon Source in hosting this event. The meeting web site (http://www.aps.anl.gov/Users/NUFO/2009_Meeting/index.htm) has pdf copies of all the presentations.

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Executive Summary

This document summarizes the discussion and recommendations from a June 11, 2009, workshop on industrial participation at federally funded national user facilities. This workshop, conducted as part of the annual meeting of the National User Facility Organization (NUFO) at Argonne National Laboratory, brought together research sponsors, industrial scientists, and user facility staff members working with industrial users. Its purpose was to obtain perspectives from each of these groups on expectations of capabilities and support, as well as real or perceived obstacles, for the conduct of industrial research at national user facilities. The agenda included presentations, followed by three breakout sessions. The following issues and recommendations were developed from these presentations and discussions, breakout session reports, and discussions throughout the day.

Issue 1: Intellectual property agreements vary among user facilities in the United States and worldwide.

Recommendations:

With the goal of increasing industrial access to national user facilities

Sponsors of user facilities should

- *Survey industrial users (both current and potential) about their concerns and work with the user facilities to respond appropriately.*

User facilities should

- *Examine and resolve prepayment processing requirements for proprietary research time that cause time delays in performing research.*
- *Identify and eliminate mechanisms impeding small business access to user facilities.*

NUFO should

- *In collaboration with facility sponsors, benchmark user facilities in the United States and around the world to identify intellectual property practices of these facilities and organizations and determine if changes are needed to facilitate industrial access.*

Issue 2: There is limited awareness of capabilities and access models for user facilities

Recommendations:

User facilities, either individually or as a group, should

- *Develop outreach mechanisms to reach technical communities at relevant conferences.*
- *Identify an industrial liaison who is familiar with the facility's capabilities, staff, and access models and willing to work closely with potential and new users.*
- *Provide examples on web pages and/or in outreach publications of industrial applications and lists of honors or awards received that are based on industrial research.*
- *Promote opportunities in FedBizOps, etc., and other locations viewed by small businesses.*
- *Improve promotional activities for small businesses.*
- *Enable easy access among multiple beam lines, instruments, and facilities at one or more laboratories.*
- *Solicit testimonials from industrial users for promotional purposes.*

NUFO should

- *Identify and promote best practices in outreach among user facilities.*
- *Identify key meetings, society journals, and trade organizations for outreach initiatives to industrial scientists.*
- *Produce NUFO brochures targeted to industry.*
- *Create a specific Web link on the NUFO Home page for industry (linked pages should include links to core competencies and key tech transfer contact persons at each user facility).*
- *Collect lists of R&D100 awards from research at user facilities and post lists on the NUFO Web site.*
- *Request links on individual user facility Web pages to NUFO pages.*

Issue 3: It takes too long to access a user facility for a time-sensitive industrial experiment

Recommendations:

Sponsors should

- *Accept a variety of approaches by user facilities to accommodate industry access that involve potentially different review approaches or measures of success for industrial involvement.*

User facilities, either individually or as a group, should

- *Develop a facility access model for industrial research to enable site and facility access within industry timeframes. One possibility is a standing fast-track proposal review and program advisory committee for industrial usage to slot industrial research requests into facility rapid-access time.*

NUFO should

- *Benchmark facility proposal submission, review, and allocation processes to identify best practices for facilitating industrial research within industry's time constraints.*

Issue 4: Industrial users typically need more assistance than other categories of users in proposal writing, sample preparation, and experiment design and analysis.

Recommendations:

Sponsors should

- *Include metrics for facility reviews that recognize the value of industrial research.*

User facilities, either individually or as a group, should

- *Include career advancement incentives for user facility staff to assist industrial users that do not necessarily involve peer-reviewed publications.*
- *Develop new mechanisms, including web-based tools, to facilitate understanding of and familiarity with the theory and practice of experimental techniques.*
- *Analyze the acceptance of proposed experiments to determine if the rate of acceptance for industrial experiments is appropriate to that for the other users.*

NUFO should

- *Include information and software tools developed for industry by individual facilities on its Web site.*

**Issue 5: Facility-specific barriers inhibit the effective use of user facilities by industry
Recommendations:**

User facilities should

- *Charter a specific advisory committee with representatives from industrial institutions to make recommendations for facility performance.*
- *Operate instruments and facilities for optimal performance and limited downtime.*
- *Include industrial representatives on facility review committees.*

NUFO should

- *Identify, in collaboration with user groups, typical barriers and bring them to the attention of the facilities and users at large.*
- *Review progress at its next annual meeting*

Purpose and Scope

This report was prepared under the auspices of the National User Facility Organization (NUFO) as an outcome of a workshop held on June 11, 2009, as part of the NUFO annual meeting held at Argonne National Laboratory. The decision to focus on industrial participation in research at national user facilities resulted from information gained during several 2008 international advisory committee meetings indicating that industrial participation at Japanese user facilities is much higher than that at similar U.S. facilities (e.g., approximately 25% of beam time at SPring-8 is used by industry whereas the current level at U.S. facilities is between 5 and 10%). To assess the reasons for this discrepancy, NUFO, which represents the interests of users at 30 U.S. national user facilities, organized a workshop with participants from both industry and user facilities to examine issues surrounding industrial use of national user facilities and provide recommendations to address identified real or perceived barriers. Workshop presenters included sponsors, industrial users, and user facility scientists who work with industrial users. Each presenter was asked to provide a brief overview of the type of research conducted, summarize expectations and issues, and, if applicable, suggest solutions. The expected outcome of the workshop was to be this report to the Department of Energy Office of Science, research sponsors, and user facility management.

The workshop organizers are grateful for the support provided by Argonne National Laboratory and the Advanced Photon Source for hosting this event. The web site at http://www.aps.anl.gov/Users/NUFO/2009_Meeting/index.htm has copies of all of the presentations.

About NUFO

NUFO, which was founded informally in 1990 and formally chartered in 2008, currently represents the interests of all users who conduct research at U.S. national scientific user facilities, as well as scientists from U.S. universities, laboratories, and industry who use facilities outside the United States. NUFO facilitates communication among users, user organizations, facility administrators, and other stakeholders. Discussion topics include the benefits and significance of research conducted at user facilities, as well as their operational needs. NUFO seeks to provide a unified message at the national level on issues of resources for science, economic competitiveness, and education for the next-generation scientific workforce. The NUFO website <http://www.nufo.org> contains additional information.

Background

The goals of investments in science and scientific user facilities are to achieve transformational discoveries and/or discoveries with significant societal benefit. National user facilities are valuable resources for integrating national laboratory, university, and industrial research to achieve these goals for the benefit of our nation. Innovation in industrial research adds significant value to the economy; lasting economic growth is based on technical progress. National user facilities enable this progress.

Scientific user facilities serve researchers from universities, national laboratories, and industry. They provide specialized instrumentation and expertise that enable scientists (i.e., users) to carry out experiments that could not be done in individual scientific laboratories. Typically, for approved peer-reviewed experiments, operating time is available without charge to those scientists whose intent is to publish their results in the open literature. Examples of user facilities include light sources (see www.lightsources.org for detailed information and a list of individual facilities worldwide), particle physics facilities (www.interactions.org), neutron scattering facilities (www.neutronsources.org and neutron.neutron-eu.net/n_links), and nanoscale science and electron beam microscopy centers. More than 10,000 researchers use the U.S. Department of Energy (DOE) Office of Basic Energy Sciences user facilities annually (listed at <http://www.sc.doe.gov/production/bes/BESfacilities.htm>). They perform research resulting in thousands of publications each year in peer-reviewed literature.

This workshop provided a snapshot of industrial interactions at user facilities. The presenters represented several constituencies: sponsors, industrial users, and user facility scientists and administrators working with industrial users. Sponsors of the funding for these facilities summarized their expectations for the scientific capabilities and operations of the user facilities. Industrial users provided examples of their achievements and concerns; facility staff members working with industrial users added their perspectives.

Scientists and engineers from academia and industrial institutions can interact with staff from user facilities in a variety of ways. Included are visits among individual researchers, experiments performed at user facilities, cooperative R&D agreements, Small Business Innovative Research awards, technology/software licensing, work performed totally by external individuals under Work for Others agreements, and personnel exchanges. Academic scientists also interact through joint faculty appointments, internships and postdoctoral fellowships, and summer appointments for students and faculty. Each type of interaction has different obligations for the parties, as well as different requirements for processing and/or approval times.

In a research environment, people (researchers) solve problems and analytical instruments provide the data. The national user facilities have experts who can read a description of a problem and recommend a course of action. The following thought was echoed by many industrial speakers: “The greatest resources at the user facilities are the scientists who use and operate them.”

Characteristics of Industrial Research

At the corporate level, few companies can afford or have the ability to design, construct, and operate large facilities similar to the national user facilities. Few companies can maintain large, scientifically diverse research staffs such as those found at the national user facilities. In particular, x-ray and neutron science experts may not be available in-house, and smaller companies are even less likely to have experts in the multiple research areas represented by the national user facilities. As a result, corporations are moving toward “open innovation” in which technologies and expertise are obtained from sources outside the company; national user facilities fit this model very well.

Individual researchers from industry are typically members of a multidisciplinary research team. Often there is little scientific continuity from program to program, as the approaches to problem resolution will vary from program to program. There is a short time available to learn new techniques; industrial scientists commonly work on multiple projects simultaneously.

Although industrial research yields innovations and fundamental insights that compare well with those generated from academic research, the results are not often publicized in order to protect intellectual property. At the same time, economic pressures have caused industrial research to become more focused. Although the generation of knowledge is important for both the academic and industrial communities, the return on investment rather than the publication can be the more important metric within industrial R&D.

The needs of industry in performing research are interconnected and include one or more of the following:

- **Quality:** Research must ultimately solve the problem or answer the question.
- **Value:** Research can be considered a variable overhead expense so value must be shown to be received for funds expended. Economic benefits must accrue to the corporation’s profitability, which affects shareholders, and society.
- **Timeliness:** The response to the research question must be timely with ease of access to research resources. The longest lead-time industrial projects often must be completed within a year, and many answers are required in less than a month.
- **Product:** Intellectual property must be retained by the corporation.
- **Compatibility:** Procedures and practices of user facilities need to support existing industrial operations and research activities.

Issues and Recommendations

Analyses of presentations and discussions identified five general issues. Addressing these issues should provide a path forward toward increasing the level of industrial participation in U.S. user facilities, thus enabling maximum benefits to our nation from industrial research. The increasing internationalization of research now means that U.S. facilities are no longer the best or only sites for industrial users. If the U.S. seeks to retain the benefits of industrial research, U.S. facilities must be competitive with those in other countries. The issues are not necessarily presented in priority order; the recommended solutions to each issue will help achieve the goal of facilitating industrial participation in research at national user facilities.

Issue 1: Intellectual property agreements vary among user facilities in the United States and worldwide.

Industrial presenters noted that intellectual property agreements vary among U.S. user facilities, depending on the funder of the facility; there are also differences in agreements between U.S. user facilities and those in other countries. User facilities in the U.S. funded by the National Science Foundation and the National Institute of Standards and Technology appear to have less formal approaches than does the DOE. For example, the National Institute of Standards and Technology form covering intellectual property is one page in length, whereas the various forms for DOE facilities are at least seven pages long.

Two areas of difference were highlighted with respect to intellectual property. In the first case, at DOE user facilities, intellectual property defaults to the U.S. government, but the user **may** elect to obtain the entire right to intellectual property; at some other facilities (Diamond Light Source and Canadian Light Source, for example), this right is assigned to the user at the outset as part of the agreement (which is clearly preferred by industry).

Second, in general at U.S. user facilities, an experiment needs to be declared proprietary or non-proprietary before the data are collected. It was suggested an option be provided to retroactively declare experiment time as proprietary. This option would allow industrial users to decide if the data are important for a patent application or need protection as a trade secret, thus giving industrial users more flexibility in planning experiments. Such an approach would probably require changes in U.S. law and /or government policies (such as DOE Orders) since it would permit, in certain cases, governmental support of private research. And a single case where an industrial user under-declares proprietary use could impact the perception of the entire facility.

Small businesses are often seriously affected by rules requiring prepayment, particularly when they must commit significant resources to the experiment with no assurance that the experiment will yield useful results. Minimum requirements for proprietary experimental time also hamper small businesses. The Department of Energy rules require prepayment for proprietary work, but the institutional procedures involved in transferring funds from the industry to the facility sometimes take several weeks. When experiment time for proprietary research is needed urgently, this factor often leads an industrial user to look for other options.

Recommendations for Issue 1:

With the goal of increasing industrial access to national user facilities

Sponsors of user facilities should

- *Survey industrial users (both current and potential) about their concerns and work with the user facilities to respond appropriately.*

User facilities should

- *Examine and resolve prepayment processing requirements for proprietary research time that cause time delays in performing research.*
- *Identify and eliminate mechanisms impeding small business access to user facilities.*

NUFO should

- *In collaboration with facility sponsors, benchmark user facilities in the United States and around the world to identify intellectual property practices of these facilities and organizations and determine if changes are needed to facilitate industrial access.*

Issue 2: There is limited awareness of capabilities and access models for user facilities

Many consider technology transfer and scientific research to be “contact sports.” As noted previously, workshop participants identified user facility staff members as invaluable resources in selecting the instrument, preparing samples, designing and conducting the experiment, and analyzing the data. Industrial researchers may not be aware of the existing techniques and capabilities relevant to their needs. This is often a function of lack of in-house expertise in these techniques within an industrial organization.

Industrial researchers typically participate in different technical organizations and meetings than do their academic and national laboratory counterparts. The journals they read are also different. Thus, the exposure to user facility capabilities enjoyed by academic researchers is less available to scientists from industry.

Identifying potential industrial applications from a web site or list of publications is a difficult task. Few U.S. user facilities have special sections of their web sites devoted to industrial applications. In contrast, the European Synchrotron Radiation Facility (ESRF) and Super Photon Ring-8 (SPring-8) have attractive and informative web sites that provide information for industrial scientists.

There are many different ways of interacting with staff members at user facilities. Industrial scientists are seldom aware of all of the possibilities and the related obligations and requirements. Several organizations identify a specific contact on their web site as an industrial liaison. This is a good practice, as the adventuresome researcher who attempts to complete an experimental proposal without contacting a user facility staff member faces a considerable challenge.

Getting the word out to the industrial community is important. A number of web sites associated with opportunities for small business involvement at the federal, state, or local level could be used to describe the capabilities of various user facilities and promote access to them.

Small businesses have fewer resources for R&D than do larger firms, and their involvement with user facilities may play a significant role in their financial success. Government-sponsored programs that provide small businesses with financial support might include travel to user facilities, which could markedly enhance the ability of these businesses to profit from facility resources.

User facilities are not just a group of individual instruments but instead are an organized collective resource that includes laboratories and other scientific facilities. To achieve the maximum potential of an on-site experiment, academic and industrial users may require access to one or more instruments, laboratories, or facilities, at one or more than one institution. Development of policies that enable access to the multiple scientific capabilities at one or more institutions in a timely manner would serve not only industrial users, but also the collective user population well. Included are policies that related to proposal submission and review, site and

computer access, training, intellectual property, and funding. (Note: NUFO is currently preparing a separate report with recommendations on many of these policy issues.)

It is not sufficient for user facilities to promote their capabilities. It is much more effective when users tell others of the value received from user facilities. Using testimonials from successful industrial users in annual reports and on web sites will enhance the visibility of user facilities and serve as another indicator of their perceived value among potential users, sponsors, and the general public.

Recommendations for Issue 2:

User facilities, either individually or as a group, should

- *Develop outreach mechanisms to reach technical communities at relevant conferences.*
- *Identify an industrial liaison who is familiar with the facility's capabilities, staff, and access models and willing to work closely with potential and new users.*
- *Provide examples on web pages and/or in outreach publications of industrial applications and lists of honors or awards received that are based on industrial research.*
- *Promote opportunities in FedBizOps, etc., and other locations viewed by small businesses.*
- *Improve promotional activities for small businesses.*
- *Enable easy access among multiple beam lines, instruments, and facilities at one or more laboratories.*
- *Solicit testimonials from industrial users for promotional purposes.*

NUFO should

- *Identify and promote best practices in outreach among user facilities.*
- *Identify key meetings, society journals, and trade organizations for outreach initiatives to industrial scientists.*
- *Produce NUFO brochures targeted to industry*
- *Create a specific Web link on the NUFO Home page for industry (linked pages should include links to core competencies and key tech transfer contact persons at each user facility).*
- *Collect a list of R&D100 awards from user facility research and post lists on the NUFO Web site.*
- *Request links on individual user facility Web pages to NUFO pages.*

Issue 3: It takes too long to access a user facility for a time-sensitive industrial experiment

Most user facilities have two or three proposal calls each year, so a wait of 6 months from proposal submission to performance of experiment is not uncommon. This traditional pattern is not conducive to industry's need for access within 30 days of identifying a problem. For faster access, many user facilities have provisions for rapid access; however, mechanisms used to identify research for rapid access generally favor academically oriented scientific research as opposed to industry-oriented experiments.

Approval for the experiment is the first step in accessing a facility. After the experiment is approved, the process to obtain site and facility access begins. If the experimenter is a U.S. citizen, or if access has been recently granted, access approval takes only a short time (i.e., a few days). However, if the experimenter is not a U.S. citizen (half of the graduate students in the United States are noncitizens, with many coming from countries deemed "sensitive" by the

DOE), then access approval can take more than 30 days. In the latter case, prompt access is not achieved within the time frame required by industry.

Recommendations for Issue 3:

Sponsors should

- *Accept a variety of approaches by user facilities to accommodate industry access that involve potentially different review approaches or measures of success for industrial involvement.*

User facilities, either individually or as a group, should

- *Develop a facility access model for industrial research to enable site and facility access within industry timeframes. One possibility is a standing fast-track proposal review and program advisory committee for industrial usage to slot industrial research requests into facility rapid-access time.*

NUFO should

- *Benchmark facility proposal submission, review, and allocation processes to identify best practices for facilitating industrial research within industry's time constraints.*

Issue 4: Industrial users typically need more assistance than other categories of users in proposal writing, sample preparation, and experiment design and analysis.

New industrial users face two distinct problems. First, a description of an experiment seeking to resolve a technological problem will need to be written and evaluated differently from a proposal seeking understanding of a scientific phenomenon. Second, simply writing an effective proposal is difficult.

There is a general impression that industrial users find it difficult to write successful proposals to access user facilities. Currently, a strong science case is the most important criterion for evaluation. Particularly with proprietary proposals, it is difficult to make such a case when compared to the cases made by traditional user facility communities. Even stating the full economic or technological benefits of the proposed research may not be feasible since the statement of those benefits can reveal significant aspects of an industrial organization's business practices. As a result, these proposals may compete unfavorably in the peer-review process.

However, writing an effective proposal may be not only a problem for industrial users but also for all who submit experimental proposals for the first time. The large user facilities receive more than 1000 proposals each year, which makes it a major challenge to offer and provide individual assistance to new proposal writers. Perhaps web-based tools should be developed to assist in effective proposal preparation and help applicants understand the theory, capabilities, and limitations behind the various investigative tools available at the user facilities. These tools should be structured to address the entire process of experiment design, sample preparation, experiment, execution, and data analysis.

The end product of the proposal process is the experiment. A number of speakers noted the lack of familiarity that industrial scientists have with user facilities they have not used, compared with other potential users who may be mentored by colleagues from academia. Often, the only mentors for industrial users are the staff members of the user facilities. One of the outputs of the experimental process is the peer-reviewed publication, which may be co-authored by a user and his user facility staff colleague. Publications are important criteria in evaluating the performance

of both the user facility and its instrument scientists. If publications appear in technical journals or conference proceedings (for non-proprietary work), or no publications appear (for proprietary work), then the performance review of the instrument scientist does not adequately reflect the effort made to interact with industry users. The performance evaluation criteria for user facility staff members need to include incentives for collaboration with industry. Additionally, the performance metrics for facilities need to recognize the value of industrial research whose results may be unpublished or appear in the scientific literature that is not considered “high impact.”

Recommendations for Issue 4:

Sponsors should

- *Include metrics for facility reviews that recognize the value of industrial research.*

User facilities, either individually or as a group, should

- *Include career advancement incentives for user facility staff to assist industrial users that do not necessarily involve peer-reviewed publications.*
- *Develop new mechanisms, including web-based tools, to facilitate understanding of and familiarity with the theory and practice of experimental techniques.*
- *Analyze the acceptance of proposed experiments to determine if the rate of acceptance for industrial experiments is appropriate to that for the other users.*

NUFO should

- *Include information and software tools developed for industry by individual facilities on its Web site.*

Issue 5: Facility-specific barriers inhibit the effective use of user facilities by industry

It is difficult for any organization to effectively conduct a complete self-examination of its performance. A group internal to a user facility examines facility performance differently than would an external group. External users would be interested in identifying factors inhibiting their performance. In practice, this is usually done by user groups or advisory boards, which may not have an industry-specific component, which means that the factors that inhibit industrial use of the facility may not be adequately recognized.

While it is in the best interest of the facility and its instruments to operate at an optimal performance level and with minimum downtime, sometimes those who do not interact directly with users make decisions that restrict users. User facilities and those who provide service and support services to the users determine the productivity of all users. Every decision needs to be examined to determine the effect on both the facilities and its users.

Recommendations for Issue 5:

User facilities should

- *Charter a specific advisory committee with representatives from industrial institutions to make recommendations for facility performance.*
- *Operate instruments and facilities for optimal performance and limited downtime.*
- *Include industrial representatives on facility review committees.*

NUFO should

- *Identify, in collaboration with user groups, typical barriers and bring them to the attention of the facilities and users at large.*
- *Review progress at its next annual meeting.*

Appendix A. Agenda of the Workshop on Industrial Access to User Facilities

Moderator: Al Ekkebus, Oak Ridge National Laboratory

- 8:30 Welcome
Dennis Mills, Deputy Associate Laboratory Director for Photon Sciences, Argonne National Laboratory
- 8:45 [A Fifteen-Year Science Policy Lesson: The Voices of Industry and Medicine Matter Most in Washington](#)
Mike Lubell, Director of Public Affairs, American Physical Society and CCNY Professor of Physics
- 9:15 [Lobbying for American Innovation](#)
John Palaoutas, Task Force on the Future of American Innovation
- 9:45 [Interactions with Industry: DOE Energy Efficiency and Renewable Energy Perspective](#)
Gurpreet Singh, Team Leader, EERE Vehicle Program Office
- 10:15 Break**
- 10:45 [Industrial Users at ORNL's High Temperature Materials Laboratory \(HTML\)](#)
E. Andrew Payzant, Senior R&D Staff Member, HTML, Oak Ridge National Laboratory
- 11:15 [Use of National Facilities in Technology Development for Energy and Transportation](#)
Ernest Hall, Chief Scientist, GE Global Research
- 11:45 [LRL-CAT: A Company's Experience at the APS](#)
Steve Wasserman, Head, Discovery Chemistry, Lilly Research Laboratories
- 12:15 No-host Lunch**

Moderator, Steve Wasserman

- 1:15 Industrial Stories: Successes and Issues (either facility or industrial user speakers)
- [Industrial Research at National User Facilities: A DuPont Perspective](#)
Michael Crawford, DuPont
 - [Creatv MicroTech, Inc.: Ten Years of Collaboration with Argonne National Laboratory](#)
Olga Makarova, Creatv MicroTech, Inc.
 - [IMCA-CAT: A production facility for diffraction data](#)
Chip Lesburg, Schering-Plough, past Chairman of IMCA
 - [Fuel-Spray Research at the APS: A User and Facility Perspective](#)
Jin Wang, Argonne National Laboratory
 - [Partnering for the Future: The SEMATECH-National User Facility Story](#)
Patrick Lysaght, SEMATECH
 - [Nanophotonics and Sensor Development for DoD Applications at the ORNL CNMS](#)
Milan Buncick, AEGIS, Technologies
- 3:15 Break**
- 3:45 Break-Out Groups to Formulate Recommendations:
- Outreach to industry and best practices
Moderator: Susan White-DePace, Brookhaven; Scribe: Jane Andrew, Argonne
 - Industrial interaction (Before site arrival: legal issues, site access, proposal acceptance, speed of scheduling, etc.)
Moderator: Judy Trimble, Oak Ridge; Scribe: Cathy Knotts, SSRL
 - Industrial interaction (After site arrival: training, badging, use of resources, sample shipping, joint authorship, inducements for scientists to work with industry, etc.)
Moderator: Susan Strasser, Argonne; Scribe: Connie Vanni, Argonne
- 4:45 Wrap-up, Summary, and Future Directions
Al Ekkebus, Oak Ridge National Laboratory
- 5:30 Adjourn**

Appendix B. Workshop Registrants

Jane Andrew, Argonne National Laboratory
John Arrington, Argonne National Laboratory
Susan Bailey, Lawrence Berkeley National Laboratory
Michael Becker, Argonne National Laboratory
Rene Bellwied, Wayne State University
Allan Bernstein, Argonne National Laboratory
Ann Bertling, The University of Chicago
Jen Bohon, Case Western Reserve University/NSLS UEC
Barbara Book, Fermi National Accelerator Laboratory
Milan Buncick, AEGIS Technologies
David Bunzow, Lawrence Berkeley National Laboratory
Linda Carlson, Argonne National Laboratory
Lavina Carter, Canadian Light Source
Javier Castro-Barba, Brookhaven National Laboratory
Gretchen Cisco, Brookhaven National Laboratory
Pamela Ciufu, Brookhaven National Laboratory
Carrie Clark, Argonne National Laboratory
Leilani Conradson, Los Alamos National Laboratory
Russell Cook, Argonne National Laboratory
Michael Crawford, DuPont Company
Julie Cross, Argonne National Laboratory
Paul Dave, Argonne National Laboratory
Francesco De Carlo, Argonne National Laboratory
Laura Morris Edwards, Oak Ridge National Laboratory
Allen Ekkebus, Oak Ridge National Laboratory
Richard Fenner, Argonne National Laboratory
Sharon Fisher, Argonne National Laboratory
Amy Flatten, American Physical Society
Ernest Fontes, Cornell University
Paul Fuoss, Argonne National Laboratory
Lisa Gades, Argonne National Laboratory
J. Murray Gibson, Argonne National Laboratory
Kenneth Goldberg, Lawrence Berkeley National Laboratory
Kathleen Carrado Gregar, Argonne National Laboratory
Ernie Hall, GE Global Research
Annie Heroux, Brookhaven National Laboratory
Matthew Howard, Argonne National Laboratory
Robert V. F. Janssens, Argonne National Laboratory
Brant Johnson, Brookhaven National Laboratory
Henia Kamil, SLAC National Accelerator Laboratory
Katherine Kantardjieff, California State University, Fullerton/Center for Molecular Structure
Elliot Kanter, Argonne National Laboratory
Denis Keane, Northwestern University
Lisa Keefe, The University of Chicago
Gary Kiger, Argonne National Laboratory
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Beverly Knott, Argonne National Laboratory

Cathy Knotts, SLAC National Accelerator Laboratory
Jeremy Kropf, Argonne National Laboratory
Lynn Kszos, Oak Ridge National Laboratory
Harriet Kung, U.S. Department of Energy
Chel Lancaster, Argonne National Laboratory
Mark Langguth, Argonne National Laboratory
Terry Law, Environmental Molecular Sciences Laboratory (EMSL)
Roger Leach, DuPont
Donald Lee, Lawrence Berkeley National Laboratory
Peter Lee, Argonne National Laboratory
Charles Lesburg, Schering-Plough
Michael Lubell, American Physical Society
Laurence Lurio, Northern Illinois University
Patrick Lysaght, SEMATECH
Jozef Maj, Argonne National Laboratory
Olga Makarova, Creatv MicroTech, Inc.
Dennis Mills, Argonne National Laboratory
Ronald Moore, Fermi National Accelerator Laboratory
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Kathleen Nasta, Brookhaven National Laboratory
Harvey Newman, California Institute of Technology
Anne Owens, Argonne National Laboratory
John Palafoutas, TechAmerica
Eric Palm, National High Magnetic Field Laboratory
E. Andrew Payzant, Oak Ridge National Laboratory
Ursula Perez-Salas, Argonne National Laboratory
Amanda Petersen, Fermi National Accelerator Laboratory
Kevin Pitts, University of Illinois at Urbana Champaign
Heather Ray, University of Florida
Rachel Reed, Argonne National Laboratory
Volker Rose, Argonne National Laboratory
Bill Ruzicka, Argonne National Laboratory
Antonya Sanders, Los Alamos National Laboratory
Melissa Santala, Lawrence Berkeley National Laboratory
Kappatolia Sherman, Fermi National Accelerator Laboratory
Leroy Sims, Oak Ridge National Laboratory
Gurpreet Singh, U.S. Department of Energy
Douglas Sisterson, Argonne National Laboratory
Peter Smith, Pacific Northwest National Laboratory
James Sowinski, Indiana University
Lorri StClaire, Lawrence Berkeley Laboratory
Susan Strasser, Argonne National Laboratory
Matthew Suchomel, Argonne National Laboratory
Joy Talsma, University of Chicago
Mary Catherine Thelen, Idaho National Laboratory
Katie Tietz, The University of Chicago
Michael Treacy, Arizona State University
Judy Trimble, Oak Ridge National Laboratory
Constance Vanni, Argonne National Laboratory
Nagarajan Venugopalan, Argonne National Laboratory

Meg Vigliocco-Hagen, Argonne National Laboratory
Jin Wang, Argonne National Laboratory
Jun Wang, Brookhaven National Laboratory
Stephen Wasserman, Eli Lilly and Company
Grace Webster, Brookhaven National Laboratory
Barbara Weller, Argonne National Laboratory
Julia White, INCITE Program
Susan White-DePace, Brookhaven National Laboratory
Marcia Wood, Argonne National Laboratory
Yuming Xiao, Carnegie Institution of Washington
Ting Xu, University of California, Berkeley and LBL Molecular Foundry, UEC
Linda Young, Argonne National Laboratory
Shaofei Zhu, Argonne National Laboratory
Paul Zschack, Argonne National Laboratory

Appendix C. Bibliography and Web Sites of User Facilities Related to Industrial Research

Bibliography

The Foundation for Developing New Energy Technologies: Basic Energy Research in the DOE Office of Science: Hearing before the Subcommittee on Energy & Environment, of the House Committee on Science and Technology, 110th Cong. (2008), (testimony of Dr. Ernest Hall). Retrieved June 30, 2009, from the U.S. House of Representatives database.

American Physical Society Committee on International Scientific Affairs. (2009). Access to Major International X-Ray and Neutron Facilities. College Park, MD. Retrieved from http://www.aps.org/programs/international/resources/upload/Facilities_Access_All_Feb_26_2009.pdf.

Selected user facility web sites focusing on industry

ANSTO: http://www.ansto.gov.au/commercial_services

Canadian Light Source: <http://www.lightsource.ca/industry/>

Diamond Light Source: <http://www.diamond.ac.uk/Home/ForUsers/industry.html>

ELETTRA: <http://www.elettra.trieste.it/ILO/>

European Synchrotron Radiation Facility: <http://www.esrf.eu/Industry>

Institut Laue Langevin: <http://www.ill.eu/industry/>

McMaster University: <http://mnr.mcmaster.ca/>

NIST Center for Neutron Research: http://www.nist.gov/public_affairs/industry.htm

Photon Factory (PF), KEK: <http://pfwww.kek.jp/outline/instr/indust.html>

SOLEIL : <http://www.synchrotron-soleil.fr/portal/page/portal/IndustrieValorisation>

South African Nuclear Energy Corporation: <http://www.necsa.co.za/Products-and-Services-399.aspx>

SPring-8: <http://www.spring8.or.jp/en/science/industrial/>

University of Missouri Research Reactor: <http://www.murr.missouri.edu/ps.php>