

SPECIAL
DEDICATION ISSUE



Advanced Photon ^{The} Source

NUMBER 9
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An Update on the Advanced Photon Source at Argonne National Laboratory

APS Dedication Marks Official Research Start



The platform group at the APS dedication ceremony took scissors in hands for a traditional ribbon cutting to officially open the APS facility. Left to right are: D. Mark Sutton (APSUO/McGill University), Ernest J. Moniz (Office of Science and Technology Policy, Executive Office of the President), Hugo F. Sonnenschein (The University of Chicago), David E. Moncton (Advanced Photon Source, Argonne National Laboratory), Hazel R. O'Leary (Department of Energy), Alan Schriesheim (Argonne National Laboratory), Michael L. Knotek, (Battelle Memorial Institute/Pacific Northwest National Laboratory), William F. Brinkman (Lucent Technologies), and Peter M. Eisenberger (Princeton Materials Institute).

May 1, 1996 — The buildings are occupied, the grass is growing, the components are installed, the accelerators are commissioned, x-ray beams are being produced, and users are poised to commence experiments. The first of May, harbinger of spring, renewal, and beginnings, was the perfect time to dedicate the Advanced Photon Source.

And so, upwards of 1,400 APS personnel, Argonne employees, and invited dignitaries and guests filled to overflowing an entire sector of the APS Experiment Hall and nearby Conference Center Lecture Hall for the formal ceremony dedicating the

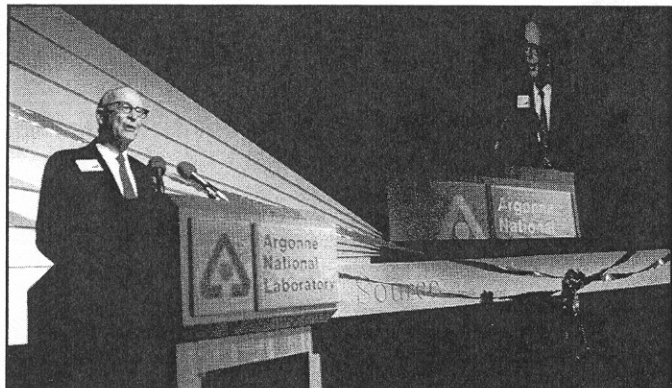
APS. They heard a succession of speakers extol the achievements that brought the APS into being, and envision the cornucopia of science that will flow from the APS in the future.

Serving as a backdrop for the speakers was a 40-ft-long, 3/4-scale model of the sign that will be erected in front of the APS central laboratory/office building.

Excerpts from the dedication addresses (chosen by the editor of *The Source*), as well as a few photographic memories of the day, follow. ●

Dr. Alan Schriesheim

Director • Argonne National Laboratory



The Advanced Photon Source exemplifies to a high order the primary mission of the national laboratories: To provide unique large facilities that serve as research tools for the panoply of American industry, academe, and government science and technology institutions. By providing x-ray beamlines of unprecedented intensity, the APS will help further the fields of materials science, chemistry, biostructural science, and geoscience, among others.

The APS is here to serve the research needs of our nation thanks to the dedication of the team that built it... They took the APS from concept to drawing

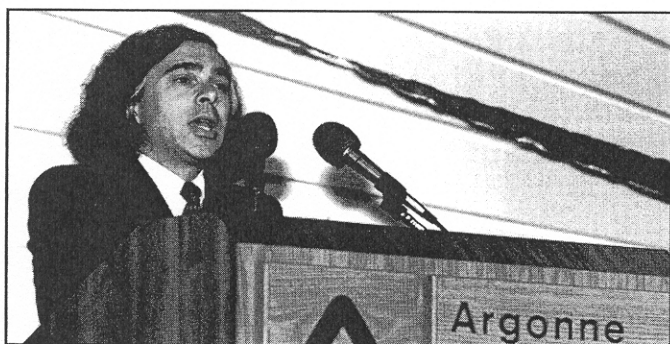
board to reality. They built it under budget, ahead of schedule, and with a superlative safety record. Not only that, I'm happy to say it works. All technical specifications have been met or exceeded in recent months. This is truly an achievement of great credit to Argonne National Laboratory and to our sponsor agency, the Department of Energy.

Because of the efforts by these and many other people, the APS stands ready to begin unlocking knowledge that will benefit every American. Researchers will probe the basic phases of materials to discover more effective ways of designing organic and inorganic structures of societal value. For example, one group comprising a dozen pharmaceutical companies will seek new drug designs. A team of industrial chemical companies, in concert with universities, will seek insights into ways of making better polymers, coatings, and adhesives. And there will be unexpected results. These results will probably emanate from groups working at the interface of biology, chemistry, and physics — fertile ground for future Nobel Prizes.

This remarkable facility is the latest proof of what I consider to be a continuing, effective relationship between science and government. ○

Dr. Ernest J. Moniz

Associate Director for Science • Office of Science and Technology Policy • Executive Office of the President



It is a pleasure to convey the congratulations and the gratitude of the Administration for bringing the American science community this third-generation, cutting-edge light source of extraordinary brilliance.

The APS that we celebrate today is one of the essential pieces of our national foundation of scientific and technological leadership — a critical piece of our science infrastructure. Its brilliance in atomic-scale resolution will open unparalleled opportunities to bet-

ter our understanding of materials. The Administration wishes to thank all those that made this possible on schedule, 100 years after Röntgen, and on budget.

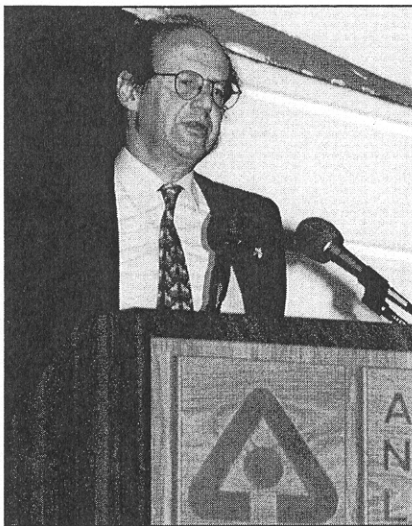
The Energy Research program is a vital national resource, as recognized by the President in his Scientific Facilities Initiatives in the 1996 and 1997 budgets... These, and other facilities throughout the nation, are not so much to be viewed as jewels in a mythical national crown, but rather as integral parts of the crown itself. The DOE, other agencies, and the Administration will need to work at continuing our scientific renewal through cutting-edge capabilities. This will be accomplished ... only through partnership with Congress and the technical community — at universities, at labs, and in industry.

Clearly, no statement will be as eloquent in support of continued scientific strength as that which will be made here in revealing nature's secrets and in seeing how they benefit our economy, our health, our environment, and our security.

We wish you very well for a brilliant future. ○

Dr. Peter M. Eisenberger

Director • Princeton Materials Institute



An accomplishment of this magnitude is the result of many events and the efforts of many people.

Fifteen years ago, the [DOE committee reports], which first spelled out the plan for development of synchrotron facilities, were character-

ized by intense debate, even animosity, about the priority order of needs.

Today, all of the recommendations from those reports have been implemented. As intense as the debate was, we were fortunate to be in a era where one, not to mention all the recommendations, could be implemented.

With this machine on the nation's agenda, the next major decision was where to build it. Here

Dr. Michael L. Knotek

Chief Technology Officer • Battelle Memorial Institute
Associate Laboratory Director, Environmental and Energy Sciences •
Pacific Northwest National Laboratory



I have been continually impressed with the strength of the idea that has driven this facility. That idea came out of the original discussions and much acrimonious debate, but it was a debate where everyone had their eye on a common

vision and the opportunity it represented.

This country needs science. There is a strong debate coming, and we are facing some very difficult times ahead in determining the future of U.S. science. In the last 50 years, we have seen an enormous growth in science that has also left us with a series of

again, the clash between the general interests and the special interests brought us to the verge of self-destruction. The synchrotron radiation research community found a solution which gave each constituency a piece of the action. In the future, there are likely to be real winners and losers, yet we must find a way to work together toward the best general-interest solutions.

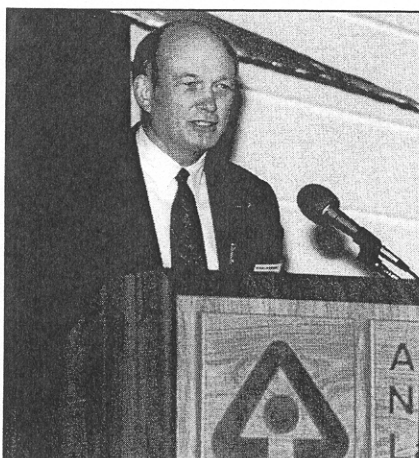
Today's milestone, and others in the field of synchrotron radiation, are unique triumphs that combine diverse people and institutions with no prior association, whose only common bond is the use of photons. I can think of no comparable accomplishment in science in where such diversity was so essential to success.

Yes, in the passion of our youth, we were ready to do battle on the basis of the wavelength of our preferred photons. Yes, there may even have been some substance to that debate. But there was no basis for even coming close to destroying our sense of community. Therefore ... I implore you to protect, and even extend, your sense of community. Have your debates ... But never forget that when the debate is over, you will need the whole community to again achieve the level of success that we are celebrating today. ○

artificial and potentially very damaging barriers between the various sectors of the scientific community. These barriers cannot be allowed to encumber us nor work against us as we try to provide the science this nation needs. And the ability to bring academia, industrial laboratories, and the government sector together are a critical feature of the model this facility presents for the future.

This is probably one of the most challenging and opportunity-rich times in this country's history. The ability of science to contribute to our economic future and to the welfare of the population is unparalleled. The science that will be done at this facility will affect our health, the environment, our national security, and our economic competitiveness. No matter how hard things get in the coming years, as we try to balance the budget and change the national priorities, we must continue to follow ideas like the one that drove this facility in order to move our science onward. ○

Dr. William F. Brinkman
Physical Sciences Research Vice President •
Lucent Technologies



It appears that the DOE and Argonne have laid down a challenge to the scientific community. We must step up and make use of this facility. And we must use it, not just to do pure science, but to satisfy the needs of our society. There is

nothing more encouraging to me than to see all the industrial participation that has been lined up to work here on all different types of applications.

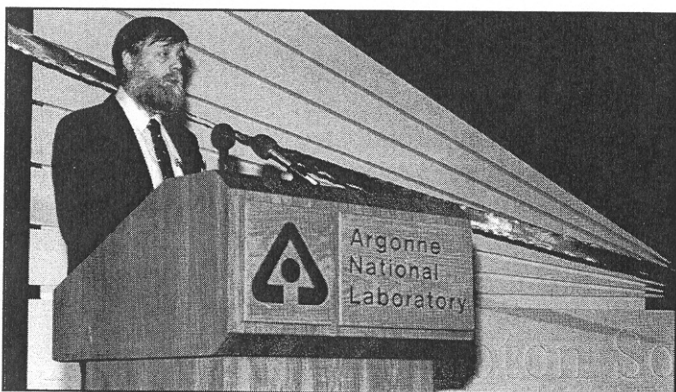
Those of us in our industry have found synchrotron radiation to be very important in a number of different ways. Let me just give you some examples. We sell an optical communications system that sends 20 gigabits per second over a single optical fiber. The core of that system is an integrated laser modulator, a little device about the size of a pinhead. Down in the core of

that pinhead is a set of materials that vary in their properties on the scale of a few microns. If one wants to understand the properties of the materials, and tune those properties to make that laser work properly, one must be able to probe on a micron scale. Only synchrotron radiation can provide such a probe, and it was synchrotron radiation that we used to successfully build that product. We have used it to study interfaces in electromigration that are so important to integrated circuits. And not least of all, we have used it extensively to learn how to do lithography.

I really look forward to the tremendous advances that are being driven by the synchrotron community and other communities to improve optics, so that in the future, reflective optics might be used to develop lithography tools.

I am sure that over the next five years we will be talking about all the new accomplishments to come from this machine. I'd like to congratulate the entire staff of the APS, Argonne National Laboratory, and the DOE. I believe that they have given us an opportunity to step up and produce some excellent science and technology. ○

Dr. D. Mark Sutton
Chair • APS Users Organization Steering Committee
McGill University



I represent two aspects of the APS. The first is as a member of an international community of scientists who have been involved as consultants on every phase of the construction and design of this particular facility.

Second, as the Chair of the User Organization Steering Committee, I represent the users of this facility. Over the last few years, I have come to realize the depth and the breadth of the commitment of the APS

staff to making this really and truly a user facility. Part of the reason that they have been able to do this is because they have adopted the user's point of view.

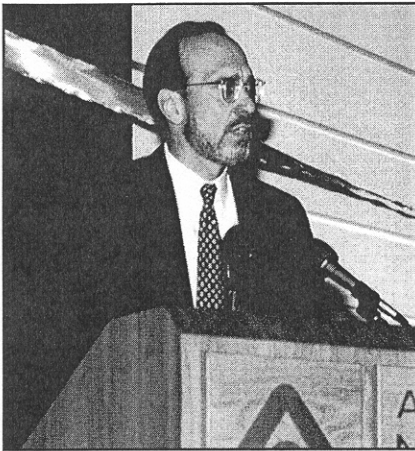
The challenge, and perhaps the onus, has now shifted from construction of the facility to us, the users. It is up to us to try and reach the full potential of this machine. And we must access the much larger group of potential users who have problems which this facility will be able to solve, even though they do not yet know it.

In order to express the thanks of the user community to all those who built this facility, a large sign will be erected in the front plaza of the central laboratory/office building. This sign will be a fitting introduction for people who come to visit the APS. A plaque affixed to the sign will read: "Presented to the people who designed and built the Advanced Photon Source. By virtue of their diligence, innovation, and commitment, they have given science a brilliant new light. With deepest gratitude from the users." ○

Dr. David E. Moncton

Associate Laboratory Director •

Advanced Photon Source • Argonne National Laboratory



I have been genuinely touched by very gracious and complimentary remarks over the last two days, in fact over many months, as we brought this facility into early operation. I have considered all of those compliments in detail,

and I have decided to accept them. But I do so on behalf of all the employees of the APS, who really made this possible. I am deeply gratified to all of you.

We are nearing the end of Alan's tenure as Laboratory Director. I want to express my deepest appreciation for his unwavering personal support for me and for the entire staff of the Advanced Photon Source. He supported us without ever micromanaging, and with confidence and an intuitive understanding of the talents of all the employees of the APS. We owe him a tremendous debt of gratitude for that steadfastness. He has made an enormous difference to Argonne National Laboratory.

It is a pleasure to dedicate this facility in the 50th anniversary year of Argonne. It is also a pleasure to dedicate it during the centennial celebration of the discovery of the x-ray. We have been captivated by this discovery. One hundred years ago at this moment, six months after the discovery itself, the event had transformed the scientific world. As some have said, the discovery ushered in the 20th century five years early.

Last fall, I attended the international celebration of Röntgen's achievement, in Wurtzburg, Germany. After days of talks, which could barely touch on the breadth of the impact x-rays have had, and after tours through Röntgen's own laboratory and two museums, the most remarkable fact I learned was this: Röntgen first detected the new rays on November 1895 and he worked nonstop for eight weeks until Christmas, eating and sleeping in his laboratory with only his wife's occasional presence. During that time, he made such a thorough study of the properties of x-rays that no one else discovered

anything new about them for 10 years, in spite of the fact that everybody in the physics community was working on them.

One hundred years later, we celebrate the feat of this remarkable individual and we acknowledge that it is still possible for a scientist working in isolation to accomplish great things. But one cannot escape the fact that discoveries in the future will depend more and more on large teams of people with highly diversified skills working together. If I were to choose a single reason for the success that we are celebrating today, it would be the success of teamwork, not just in working together across boundaries of disciplines, and cultures, and institutions, but in seeing the support and encouragement of a team provide even greater motivation for achievement than an individual working alone might possess.

The APS staff, other contributors at Argonne, the Department of Energy (both in the Chicago office and in Washington), our colleagues at the University of Chicago, scientists from 150 user institutions, the hundreds of vendors and contractors — all formed an extraordinary team. From that team came an achievement beyond what any individual could have accomplished.

It has been an enormous pleasure and privilege for me to have worked with all of these people to create something of such value for science and for the country. We could not possibly be prouder of what we have done. We consider it the experience of a lifetime, although I think every one of us would jump at the chance to do it again.

The challenge ahead of us is even greater: to produce the bounty of scientific knowledge that will make this facility worthy of the investment that has been made in it.

The users are the key to this success. The staff of the APS stands ready to do everything we possibly can to assist in realizing that vision. The beautiful new sign which will be placed on the plaza, with its very thoughtful inscription, will constantly remind us that this facility was built for its users (sometimes we need to be reminded of that), and that the users are grateful for it (sometimes I guess we need to be reminded of *that*.) Although today we celebrate the conclusion of construction, the APS remains very much a work in progress. ○

Dr. Hugo F. Sonnenschein President • The University of Chicago

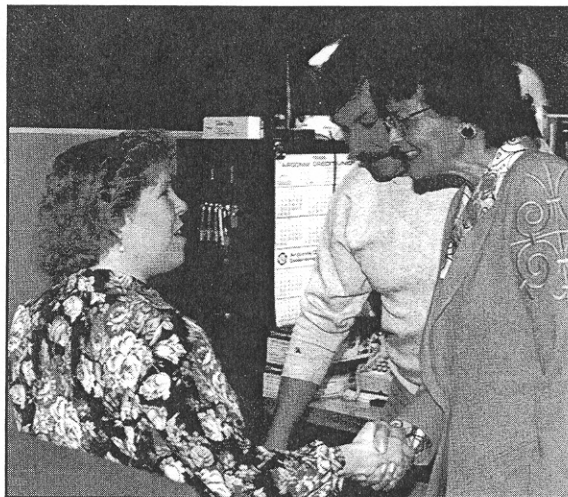


The Advanced Photon Source demonstrates the extraordinary achievement possible when universities, government, and industry share a vision and come together to see that vision through. So much of what this nation needs can be gained from the

ability to have a vision, to sell that vision, and to bring people together to realize that vision. The Advanced Photon Source would not have come into being without the joint efforts of research universities, private-sector corporations and individuals, Illinois Governor Edgar and the leaders in the State Legislature, and most significantly, the Department of Energy. The University of Chicago is gratified to have been a part of this collaboration, which has produced a national resource: a facility that is the most powerful of its kind in the world, and a facility that was finished within budget and ahead of schedule.

Great science is based on addressing fundamental questions. More often than not, the technological advances necessary for such investigations, and the technology made possible through such investigations, have substantial and wide-ranging applications. Work done at the APS will provide physicians with new therapies for treating digestive disorders, and problems associated with blood clotting and blood pressure. By allowing us to examine at an entirely new level of detail, the APS will make possible groundbreaking investigations into the structure of proteins and enzymes. Research at the APS will also develop better techniques for growing semiconductor crystals for electronics applications. And APS beamlines will allow us to study the structure of polymers, leading to the development of a new generation of light-weight, high-strength synthetic fibers and materials.

The APS is an expensive undertaking. In an era when public dollars for science and technology are scarce, all of us involved in this project must recognize the public trust that the APS represents. The APS will play an important role in demonstrating the importance and the benefits of science, and so it will demonstrate that such trust is well placed. ○



While touring the Advanced Photon Source prior to the dedication ceremony, Secretary of Energy Hazel O'Leary (r.) meets Barb Hall and Ken Bult (both ASD-ME) in the Experiment Assembly Area.



Secretary O'Leary and Bill Kurtis of WBBM-TV Channel 2 in Chicago chat during the dedication luncheon.



Bob Wunderlich, APS Project Manager for DOE's Argonne Area Office, briefed Secretary O'Leary on APS technology.

Hon. Hazel R. O'Leary
Secretary of Energy • U.S. Department of Energy



We could not spend this afternoon in a better way than to celebrate the excellence, the teamwork, and the focus that, to paraphrase the marvelous statement from the users, has given science a brilliant new light.

Along with many others, I

believe that the Advanced Photon Source provides a case study for the future in terms of development, advocacy, and support of big science in the United States of America. This advocacy and support must come from a recognition of the requirements for fundamental science, and a pragmatic realization that applied science will capture the public's imagination so that we can continue to generate enthusiasm for projects such as this one. If the science done at this great project is made clear to the general public, that understanding can garner the support of great political leaders in the executive and legislative branches of our government.

Those of us here today realize that this type of facility is essential for maintaining the leadership in science and technology that has made America competitive in the 20th century, and that will continue to give us that competitive edge in the 21st century. But what does it take to convince American taxpayers that the APS is worth over 800 million of their dollars?

Even as we celebrate, other nations are poised to beat us in our quest for leadership. Projected federal funding for non-defense research and development for the year 2000 puts the United States of America behind Japan. If we stay on our current funding trajectory — and I am not so certain that we can, given what I have seen come out of appropriations subcommittees this past week — we will spend \$25.7 billion for non-defense research. Japan, meanwhile, will spend \$35.12 billion.

If we are to maintain our leadership position, we must show that this facility produces. Take, for instance, the DuPont-Northwestern University-Dow Chemical Collaborative Access Team (DND-CAT). Every American citizen can understand textiles. DND-CAT will create fiber in a spinning machine located in a beamline, to learn how atoms arrange

themselves in fabrics being spun. This can lead to new fibers and products that are stronger, more durable, softer, more comfortable, and less expensive. These are the kinds of innovations that will make American companies more competitive in the international marketplace. This same group is studying cement, paints, and other coatings. They will also investigate the possibilities for new, non-toxic food preservatives that do not react with foods or containers to alter the taste or freshness of foods.

By the year 2000, the total cost to the global economy for AIDS treatment and research is expected to be \$514 billion. In the U.S. alone, AIDS will siphon off an estimated \$81 billion to \$107 billion from the economy in the year 2000. An APS collaborative access team, from the University of Chicago, will study how viruses, such as the one that causes AIDS, attach to cell membranes. This is a lock-and-key type of problem: Once the structure and function of a lock is known, one can more easily devise the key to control that lock. When we know better how viruses work at the most basic levels, we can figure out how to render them harmless.

APS CATs will be looking at marketable technologies which will improve our quality of life, make our country more economically competitive, and address issues involving the environment and national security. Those are benefits people can understand. And supporting this type of research is an appropriate role for government.

So, when the American taxpayer asks, "Why the APS?" the answer is that if our government does not do it, then it will not happen here at all. But it *will* happen in other great nations.

I cannot match the words of praise we have heard today from those who were so intimately involved with this project. But allow me to add my applause for Alan Schriesheim and his leadership, for this great team of scientists here at the Laboratory, for the users, the construction workers, the technicians, for the unions who saw the vision and helped it to become a reality. They are all part of the great collaboration that will be necessary to take us where we need to go in the 21st century.

I hope we all leave here with a clear understanding that in this age, when the advocates for basic and applied science are too few, we need to share our enthusiasm for this accomplishment with others. And we need to speak of this project in language that allows our neighbors to understand the value of the APS to science, to America, and to the world. ○

Scenes from a Dedication



More than 1,000 Argonne employees and invited guests filled an entire sector on the Experiment Hall floor, where the APS dedication ceremony was held.



A mariachi band provided musical accompaniment for the après-dedication party.



Argonne Director Alan Schriesheim greeted a group of well-wishers following the dedication ceremony.



Relieved APS employees (and easily influenced guests) performed an interpretive dance of cleansing, gratitude, and celebration to mark the end of APS construction.

The Source is a vehicle for enhancing communications within the APS on matters of technical progress, ES&H, research programs, and management news. Address story suggestions and comments to FENNER@ANLAPS or Rm. A4119, Bldg. 401.

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PHOTOGRAPHY ANL Media Services

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