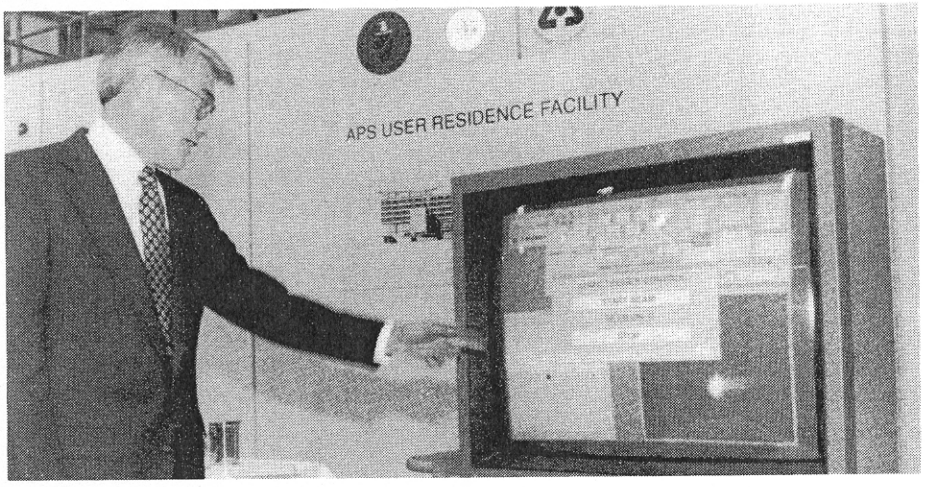
An Update on the Advanced Photon Source at Argonne National Laboratory

The Source

MARCH 1994 Number 6

It's official: APS commissioning under way



↑ *Illinois Governor James Edgar fires the first official pulse of electrons down the APS electron linac. The monitor displays a real-time image of electrons striking a fluorescent screen. The completed linac, looking upstream from the low-energy transport line, is shown in the photo below. (ANL photograph 16438K #16)*

Illinois Governor James Edgar mixed business with physics during his visit to Argonne on January 26, 1994. With the click of a mouse button, the Governor fired the first ceremonial shot of electrons down the Advanced Photon Source electron linac. This pulse officially inaugurated the year-long commissioning program that will bring the APS positron accelerators and storage ring into operation. By triggering the linac, Edgar also played a role in proving the versatility of the APS-developed software EPICS, the Experimental Physics and Industrial Control System that will run the APS accelerators.

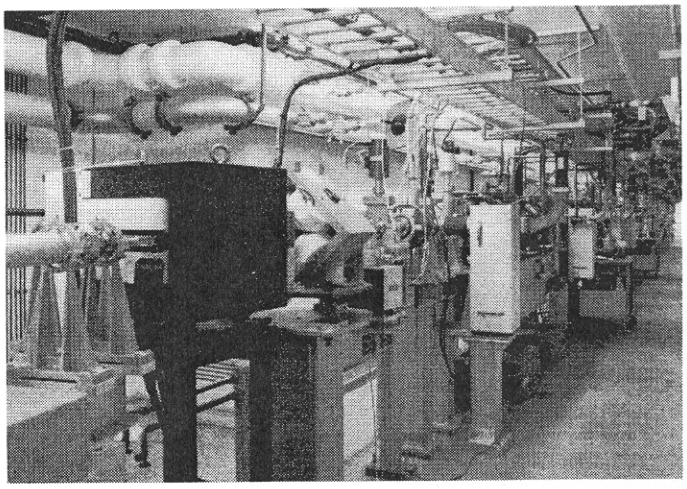
Segueing from the micro to the macro, the Governor then presented Argonne Director Alan Schriesheim with a sizable check in the amount of $1,500,000 in state funds for preliminary design work on the 240-bed APS user residence facility.

A standing-room-only crowd on the floor of the APS experiment hall at sector 6 heard welcoming remarks by Schriesheim, Cherri Langenfeld, manager of the DOE Chicago Operations Office, and David Moncton, Associate Laboratory Director for the APS. Calling Argonne "one of the great treasures of the state of Illinois," the Governor noted that "taking this [APS] technology and applying it [will keep] our industries at the forefront [of] competition with other companies around the world."

The task of linking the gubernatorial digit to the APS linac, and making the first official electron pulse visible to all, fell to the Accelerator Systems Division Controls & Computing and Linac groups. As Bill McDowell, Con-

"Commissioning" cont'd on page 8

(ANL photograph 16698K #9)

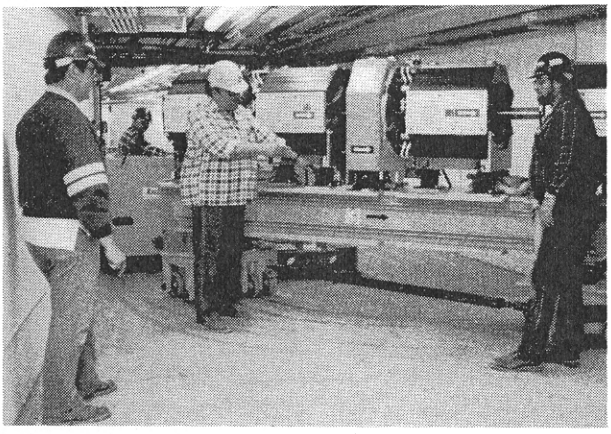


As *The Source* went to press, the APS linac had accelerated electrons to 344 MeV. (The linac is designed to supply 450-MeV beam to the Positron Accumulator Ring [PAR].) The PAR, meanwhile, had achieved 14,000 turns of 250-MeV electron beam.

On Friday, April 1, the Project was granted beneficial occupancy of the balance of the storage ring tunnel and experiment hall. No fooling.

Installing the APS storage ring: Part II

Installation of technical components at the APS is accomplished by the combined efforts of a very large number of people. Most of the installation work is done under contracts with construction-trades subcontractors who provide the required skilled electrical, pipe fitting, millwright, etc., craftspersons to carry out that work. Actual oversight and day-to-day supervision of craft work is provided by APS installation supervisors. In some cases, where very specialized skills are required (work on the ultra-high-vacuum systems, for example), the installation work can only be done by APS experts who have been extensively trained in the necessary techniques. In all cases, the final hook-up and check-out of all technical components is carried out by APS personnel. Since there are thousands of such hook-ups, this is a rather large effort. The photographs presented here illustrate some of the installation efforts engaged in by APS employees.

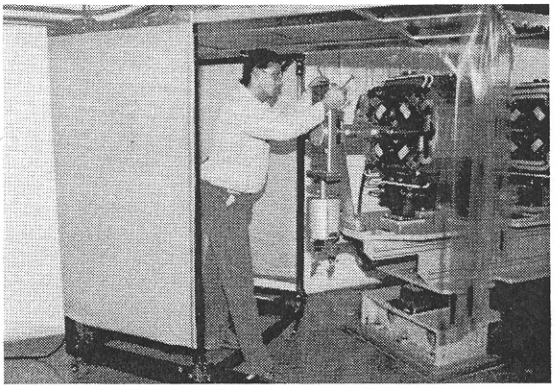


↑ Mike Kuzmicz (left, ASD-ME), Early Assembly Area (EAA) coordinator, watches as Ray Gatz (driving the transport dolly), Jim Houtari, and Jim Atton (all millwrights with MSI Contracting, Inc.) haul a completed 7.5-ton #3 quadrupole girder into the storage ring. The millwrights will ease the girder into position on its pedestal, and then return to the EAA for the next girder. *(ANL photograph 16835K #20)*

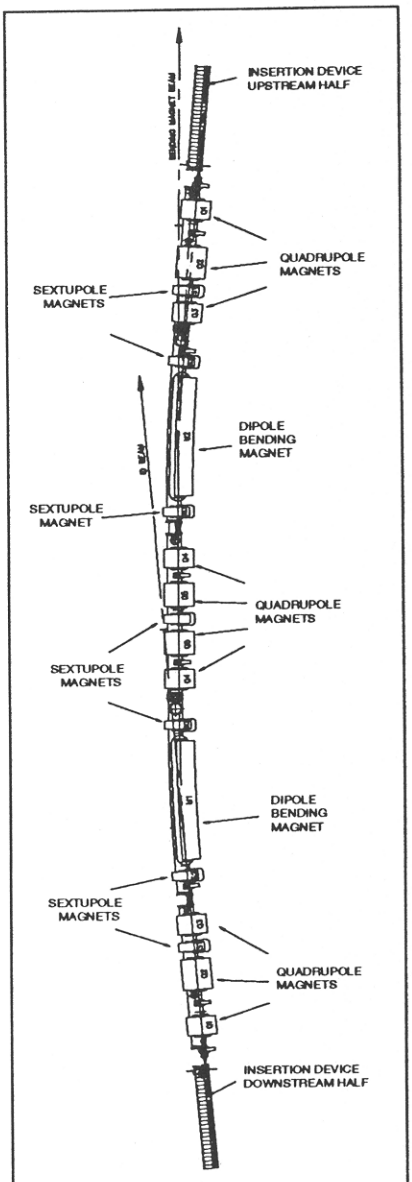
→ Kevin Knoerzer (l.) and Bob Wilson (both ASD-VAC) prepare to install a non-evaporable getter pump assembly. These pumps will achieve the required vacuum state inside the storage ring vacuum chambers. Assembly is achieved by bolting the cylindrical pump housing to its vacuum chamber. *(ANL photograph 16449K #4)*

Next issue:
Hookups & lineups

→ Mark Martens (ASD-VAC) installs an rf beam-isolation valve at the end of storage ring sector #1. Eighty of these valves go into the storage ring, one at each end of all 40 sectors. The valves automatically close in the event of a misteered beam, isolating the sector impacted by the beam. The valves are shaped exactly like the beam channel inside the vacuum chambers; when closed they prevent rf signal from entering the valve (hence the name "rf valve"). Martens is working inside a portable cleanroom designed by the ASD Vacuum Group. Every vacuum joint assembly is carried out inside one of these portable cleanrooms to keep dirt and contamination out of the vacuum chambers. *(ANL photograph 16449K # 7)*

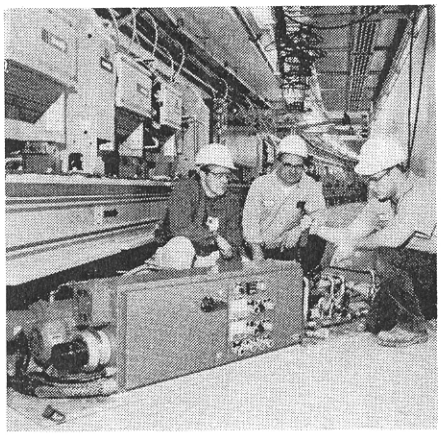


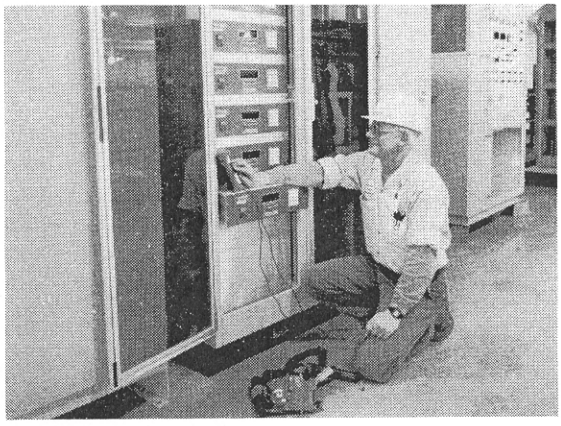
← The "Water Group," a subset of the ASD Mechanical Engineering Group, pretends to not notice the camera as they gather in the storage ring. Dick Kneebone (from left), Bob Dortwegt, Allyn Machnikowski, Bill Shackleton, and Ed Black are responsible for the design and installation of some 8,000 engineered connections between APS accelerator and storage ring components and the high flow-rate, closed-loop deionized- and chilled-water delivery systems that originate at the utility building. *(ANL photograph 16699K #2)*



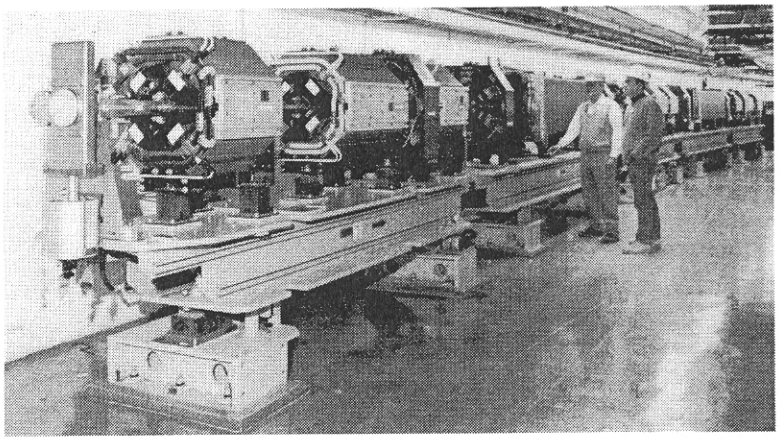
A bird's eye view of one sector of the APS storage ring. See issue #4 of *The Source* for details on the storage ring magnet lattice.

→ John Gonczy (ASD-ME), Frank Gegan (ASD-VAC), and Rich Ferry (ASD-ME) work on a storage ring vacuum bakeout sled. One of these sleds is located under quadrupole girder #3 in every other (even numbered) storage ring sector. The sleds, which were designed by Gonczy and fabricated by Ferry and Gegan, will each bake-out two sectors' worth of vacuum chambers. *(ANL photograph 16698K #9)*

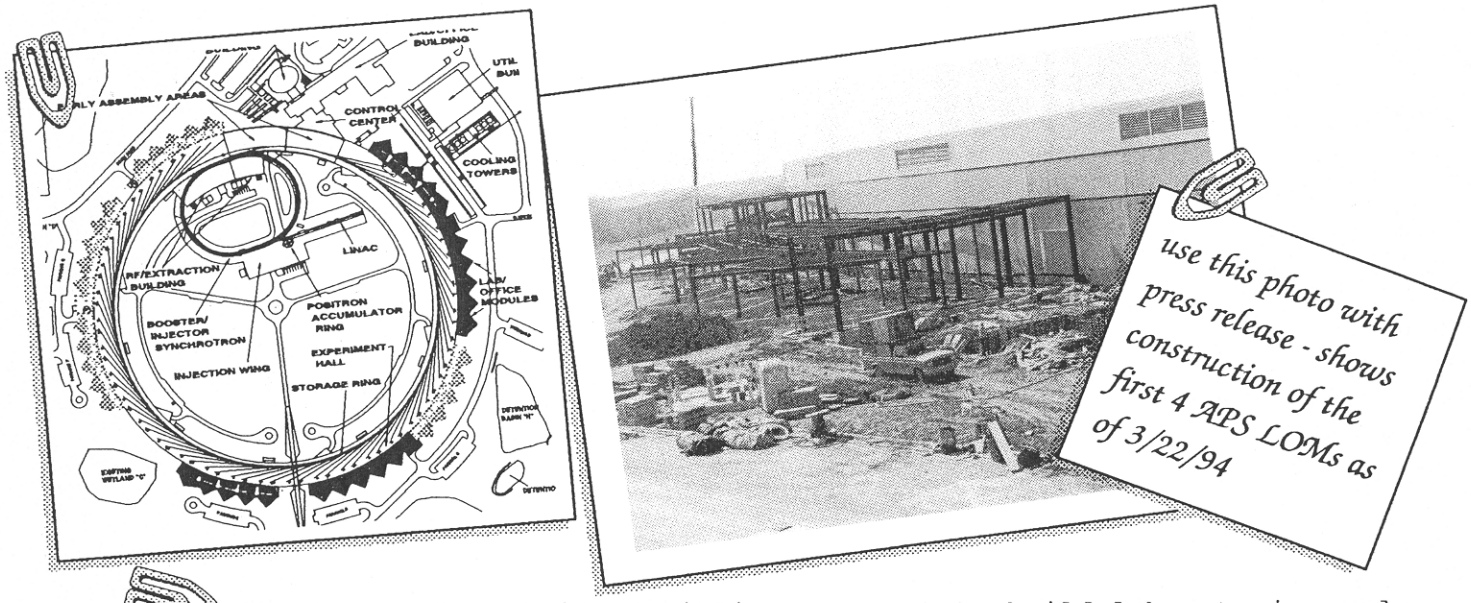




← Dick Prien (ASD-VAC) performs a final checkout on one storage ring sector's worth of ion-pump power supplies, part of the control system. Like the other power supplies, this one is located atop the mezzanine over the storage ring enclosure. *(ANL photograph 16450K #3)*



→ John Noonan (left, ASD-VAC Group Leader) and Bob Ferry (ASD-VAC), storage ring installation coordinator, cast appreciative eyes on the first completed APS storage ring sector, on January 27, 1994. As this issue of The Source went to press on April 5, 1994, storage ring more than 35% of the storage ring girders had been installed. *(ANL photograph 16448K #2)* ○



ARGONNE, ILL. – A $10.3 million contract to build laboratories and offices for scientists using Argonne National Laboratory's Advanced Photon Source (APS) has been awarded to Wil-Freds Construction Co. of Aurora, Ill.

The contract calls for construction of an initial four lab/office modules (LOMs, shown in black in the attached diagram) positioned around the perimeter of the APS experiment hall, which is two-thirds of a mile in circumference.

Each of the LOMs will contain a central, common-use area and four neighboring units, two on each side. The common-use areas will provide space for shops and other services and facilities to be used by all the tenants of each module. The neighboring units will each contain a chemical laboratory, an electronics laboratory, and an open area to be divided into offices.

By locating user labs and offices in close proximity to the experiment hall, APS planners assured that researchers would have rapid access to their beamlines. This is part of the Project's overall objective of making the pursuit of science at the APS as efficient and cost-effective as possible.

When the APS is completed, it will have a total of eight 19,000-sq-ft LOMs. These LOMs will accommodate up to 250 visiting scientists at a time, or some 2,000 per year. The contract with Wil-Freds allows for construction of the remaining four LOMs at the discretion of APS Project management and the U.S. Department of Energy.

This activity is being administered by the APS in the persons of Valdean Ohlsson (APO-PRO), who is the supervisor of construction contracts, and John Sidarous (APO-CFG), who is the project manager for Conventional Facilities.

The APS is a large synchrotron light source designed to generate the world's most brilliant beams of x-rays for inquiry into many scientific realms, including materials science, pharmaceuticals, chemistry, physics, medical and biological imaging, geoscience, agricultural science, and environmental science.

The APS is the largest federally funded research construction project in Illinois in 25 years.

APS construction is funded by the U.S. Department of Energy's Office of Basic Energy Sciences.

-30-

NEWS
You May Use

From the Advanced Photon Source
Argonne National Laboratory
9700 South Cass Avenue, Argonne, IL 60439

APS Procurement creates a buyer's market

Purchasing high-tech, state-of-the-art equipment for a world-class scientific research facility such as the APS requires procurement skills and tools that meet the challenges presented by the complex universe of government contracting and global procurement. APS Project procurement requests range from paper clips to tons of steel and copper and include sophisticated electronics, one-of-a-kind specialty fabrications, devices that exist only as a computer-aided drawing and a set of specifications, and even entire buildings, ready to be assembled. Successfully filling these requisitions means effective utilization of nearly every type of contract authorized by the Federal Acquisition Regulations and Department of Energy Acquisition Regulations.

APS-PRO

The APO-PRO team. Front row, l. to r.: Barry Miller, Bob Pfile, Tony Puccillo. Back row, l. to r.: Char McDade, Greg Groszek, Gene Desaulnier, Kim Lalumendre, Bill Comerford, Candy Mallon, John Argyrakis, Val Ohlsson, Cindy Domann, Bill Dobricky, Judy Olson, Angela Rhoads. Not pictured: Jimmy Grant.

Under Gene Desaulniers, APS Procurement (APO-PRO) Manager, APO-PRO is an organization that focuses on individual customer satisfaction and offers the contracting expertise of skilled specialists. Fiscal years 1993 and 1994 have been and are plateaus for Project spending. "Since fiscal year 1992," observed Desaulniers, "the volume of procurements handled by APS Procurement has increased 209%." In spite of that increase, APO-PRO has reduced the average turnaround on major procurements from the 165-day cycle of FY1992 to 85 days in FY93. This feat has been accomplished by a limited number of people who meet customer needs while handling 90% of the work in-house, and saving money in the bargain.

The goal for APS procurements is clear: "Always achieve two of three options," stated Desaulnier, "with safety as a constant: It's good, it's fast, and/or it's cheap. Our customers can have two out of three, but they can't have all three. If it's good and it's fast, it will not be cheap, because you'll pay a premium. If it's good and cheap, it will not be fast, because the vendor sets the pace. It will almost never be cheap and fast. By working closely with our customers, we can determine their needs and deliver accordingly."

The key is teamwork. APS technical and procurement personnel have combined their knowledge and skills on critical procurements from the early planning stages through delivery and final payment. As a result, good decisions are made earlier, flexibility is maximized, and customer response is improved.

In 1989, APS management realized that the critical path of the Project would run directly through Procurement. Initial APS procurements, including the architect/engineer and construction management contracts, were handled by the ANL Central Procurement Department. In anticipation of exponentially increasing Project procurement activity, APS acquired the services of a small group of ANL Procurement personnel assigned to the Project. As the Project gathered speed, Project Director Ed Temple saw the need to create a wholly separate procurement function within the APS organization. Building upon the original group, APS recruited additional procurement specialists to maximize the contracting ability of the Project.

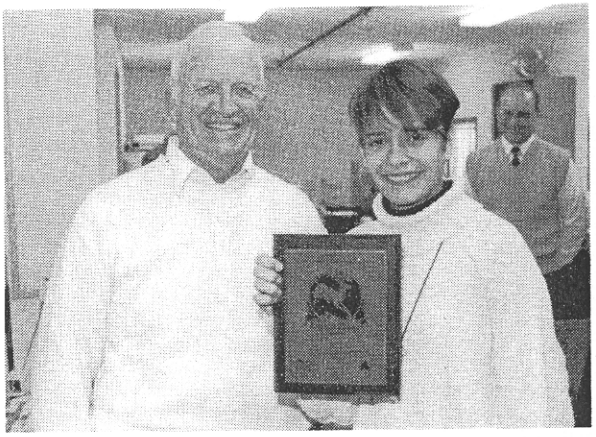
APS Procurement is organized to accommodate whatever customer requirement comes through the 378T door, while adhering to regulatory requirements. A Systems Acquisition branch, supervised by Bob Pfile, handles the purchase of all major technical components. Contracting for these items, whether they are off-the-shelf or require fabrication, calls for detailed advance procurement planning supported by specialized staff training and skills.

The other organizational element is the Procurement Support

"Procurement" cont'd on page 8

APS Pacesetters

↑ WAYNE FOSS, NEIL SARKAR, and ANGELA ZANELLI (l. to r., all APO-CST) receive their group Pacesetter Award from APS Project Director ED TEMPLE. The three produced working schedule documents that allow ASD Mechanical Systems to fabricate and install the accelerator and storage ring technical components. The effort involved many hours of weekend and at-home work in order to translate cost and schedule data within the required time frame.



↑ ANGELA RHOADES (APO-PRO), shown here with APO-PRO Manager GENE DESAULNIER, received a Pacesetter Award for her exemplary performance in providing administration support for APS construction contracts, and maintaining the files for RUST Engineering and Knight Architects, the two largest contracts administered by APO-PRO.

Bizek's Cube

Recently, Hana Bizek (ASD-PHY), pictured above with several of her ever-present Rubik's Cubes, won a "viewer's award" in the juried employees' art show sponsored by Arts at Argonne. Her winning submittal was a design, called CTYRRAD, made of 27 Rubik's Cubes. We asked Hana to describe her work, and she was kind enough to respond as follows:

Basically, what this "project" involves is creating composite geometrical designs from a set of Rubik's Cubes. The large cube in the accompanying photograph shows the type of design that was submitted. You will observe the continuity and geometrical symmetry on all the cubes. Even though a photo can only show three of the design's six faces, the other three are identical to these. Indeed, it is the property of these designs that opposite faces are exactly the same, both in color and geometry; such designs are called reflection-equivalent. Under these circumstances, the CTYRRAD design has only four colors on its six faces. I will let you figure out the reason for this. In other words: How can it be that a design made of ordinary Rubik's Cubes, with six colors on the cubes' six faces, exhibit four colors only? (Absolutely no mechanical tampering with the cubes is allowed, only conventional fiddling.)

The general algorithm is extremely simple. Take a Rubik's Cube, construct a pattern on it and put it aside. Take a second Rubik's Cube, produce typically a different pattern on it, paying careful attention to proper color-synchronization with its neighbors, and put it aside. Continue this process with the other 25 cubes, and then stack the cubes together so that a pleasant design is constructed, one that exhibits some symmetry on all six faces.

How to do it? The general algorithm needs to be refined. The algorithm refinement, however, proves to be very, very difficult. When I have shown people the way CTYRRAD is done, I heard complaints of "dizziness" and "headaches." There is no way around it; before you start implementing these designs, you must have mastered the complete solution to the Rubik's Cube as a prerequisite. But otherwise, it's a great source of enjoyment. So get yourself 27 Rubik's Cubes and start constructing CTYRRAD. If, by any chance, you need assistance, I am always around. — *Hana Bizek*

APS ES&H names and numbers ...
... to call when you need ES&H information

IN ANY EMERGENCY, DIAL 911.

The names and ANL telephone numbers listed here identify individuals who can serve as resources for ES&H information. If, in the course of your work, you have any ES&H questions, you are urged to seek assistance.

APS ES&H Program Manager & ALD-ESH/QA Representative	**R. Hislop**	2-4600	Page 612-2688
DIVISION ES&H COORDINATORS			
ASD	**J. Lang**	2-7021	Page 4-1585
XFD	**B. Stockmeier**	2-9394	
Construction Safety	**R. Coll** (ANL ESH-SE)	2-7580	Page 4-1366
Area Emergency Supervisors			
Linac	**Dave Yuen**	2-9427	Page 4-1823
Bldg. 360	**Bill Sullivan** (IPNS)	2-6296	
Bldg. 362	**Gary Gunderson**	2-6605	Page 4-1435
Bldg. 368	**Al Hillman**	2-3569	
APS Ring Managers:			
PAR	**Michael Borland**	2-4205	Page 205-8313
Synchrotron	**Steven Milton**	2-9101	Page 205-6793
Storage ring	**Glenn Decker**	2-6635	Page 205-7772
Building Managers			
Building 330	**Ralph Ditch** (EWM)	2-8057	Page 4-1196
Building 340	**Tony Torres** (EWM)	2-7458	Page 4-1343
Building 360	**Ira Bresof** (IPNS)	2-8705	Page 4-1555
Building 362	**Pam Styka**	2-5791	
Building 368	**Al Hillman**	2-3569	
Building 371	**Terry Smith**	2-5876	Page 4-1490
Building 376	**Jim Biggs**	2-6355	Page 4-1527
Buildings 378 & 382	**Joe Gagliano**	2-9387	Page 4-1524
Buildings 400, 410, 411, 412, 415	**Bob Whitman** (ECT)	2-6020	Page 4-1846
Building 450	**Ray Kijowski** (PFS)	2-9385	Page 4-1734
Building 481	**Margaret Robinson**	2-6399	Page 4-1447

APS SAFETY COMMITTEE *Chair

NAME	EXTENSION	BLDG	PAGE
J. Bridges	2-3966	371T	None
R. Hislop*	2-4600	362	612-2688
C. Krieger	2-6353	363A	None
H. Moe	2-9097	362	4-1944
R. Nielsen	2-3458	362	None
W. Wesolowski	2-4898	371T	4-1826

APS SAFETY SUBCOMMITTEES *Chair

Electrical Safety			
W. Wesolowski*	2-4898	371T	4-1826
Emergency Safety			
R. Nielsen*	2-3458	362	None
Radiation Safety			
H. Moe*	2-6180	363A	4-1944
Hazardous Mat. & Cryo. Safety			
C. Krieger*	2-6353	362	None
Personnel Accident Prevention			
J. Bridges*	2-3966	371T	None
Mechanical Hazards			
G. Goeppner*	2-5654	378T	None
Construction Site Safety			
B. Taylor (Rust, Inc.)	2-3303	481-A182	
R. Coll (ANL ESH-SE)	2-7580	481C	4-1366

CLIP & POST

CLIP & POST

"Commissioning" cont'd from pg. 1
trols & Computing Group Leader, explained, "Our EPICS software can be run from anywhere on the Ethernet. We merely had to bring Ethernet services to the experiment hall sector where the ceremony was to occur. That meant we had to coordinate with contractors to have a fiber-optic cable pulled from the injector control room in the Injection Building, through the connecting corridor, down into the storage ring, along the storage ring, and all the way to the ratchet door at sector 6 — a distance of some 800 meters.

"Next, the fiber-optic cable was terminated and a fiber-to-Ethernet adapter affixed. With the cooperation of the contract millwrights, we had workstations and a large-screen monitor moved to the ceremonial platform in the experiment hall." All of this had to be accomplished on a tight schedule. Ned Arnold, Scott Benes, Jim Bulka, Eric Koh, and Bruce Stejskal of the Controls & Computing Group worked late the night before the ceremony to establish the live video links that transmitted the image of electrons striking the first fluorescent screen in the linac. "From that point," McDowell continued, "it was a simple matter of running our regular EPICS controls software, with the addition of a special on-screen 'Governor's Button' designed by Ned Arnold to be very large so that it could be seen from across the room.

"The whole process was fun," said McDowell. "Running the fiber optics allowed us try some of our video-signal-to-fiber converters. The same equipment that brought the live linac picture to the experiment hall will be used to monitor all the doors and mazes in the accelerator and storage ring enclosures.

"But perhaps most important to us, we proved to our satisfaction that EPICS can provide network-based, flexible control of the APS accelerators from any location tied to the Ethernet. This gives us redundancy for accelerator control. We will have duplicate control systems installed in both the injector control room and the main control center. If something happens to the main control center, for instance a fire or a localized power outage, the alternative control system will take over instantaneously to prevent loss of stored positron beam."

The EPICS control system has been jointly developed by the ASD Controls & Computing Group, and researchers at Los Alamos National Laboratory (LANL), where EPICS originated. The system provides a high-performance, distributed runtime environment for controlling a large facility. It includes graphic- and text-based tools for data-acquisition and controls. A licensing agreement was issued by LANL, resulting in a first royalty payment to Argonne. Argonne collaborators now include Lawrence Berkeley Laboratory, CEBAF (with industrial partners), and DESY. Commercial licenses have been granted to Tate Industries, Baltimore, MD, Kinetic Systems, Lockport IL, and Titan Inc., Denver, CO. ○

"Procurement" cont'd from page 5
Group (PSG), supervised by Barry Miller. The PSG is responsible for all of the non-systems purchases, such as Priority-1 orders, software, and blanket purchase orders. In terms of sheer volume, PSG handles 10 times more requisitions than the Systems Group.

The APO-PRO team also includes individuals dedicated to specialized tasks. An in-house cost-and-price analyst expedites the processing of major acquisitions. A construction contract officer coordinates with Rust Engineering and the architect engineer, and is directly administering the contracts for construction of the lab/office modules and the central lab/office (CLO) building. A design/build concept introduced by APO-PRO for the CLO is a different approach than has been used by the Laboratory in the past.

APS Procurement employs advance procurement planning, shepherds the progress of each major requisition through the procurement process, and monitors the delivery status of each major contract after award. An on-line requisition system, developed by APO Management Information Systems, is tied into the Project schedule and provides detailed, current data. This allows APS management to see the procurement plan for an entire fiscal year and compare requisitions on-hand to total dollars available.

"The organization we've developed has enabled us to handle a significant volume of work with a limited number of people," said Desaulniers. "One of the primary ways we serve our customers is to act as a guide through the DOE procurement system and make sure that both the customers' and DOE's requirements are met."

—William Comerford
APO-PRO

The Source is a vehicle for enhancing communications within the APS Project on matters of technical accomplishments and progress, ES&H, research programs, and management news.

EDITOR **Richard Fenner**
EDITORIAL ADVISORS **Joanne Day, Donald Getz, Russell Huebner, Sr.**
PHOTOGRAPHY **ANL Media Services**

Address story suggestions and/or comments to Rm. G-218, Bldg. 360 or FENNER@ANLAPS.

The Source *is issued by the Advanced Photon Source at Argonne National Laboratory, which is operated by The University of Chicago under contract with the U.S. Department of Energy.*