Monthly User Operations Meeting

Stephen Streiffer

October 29, 2014

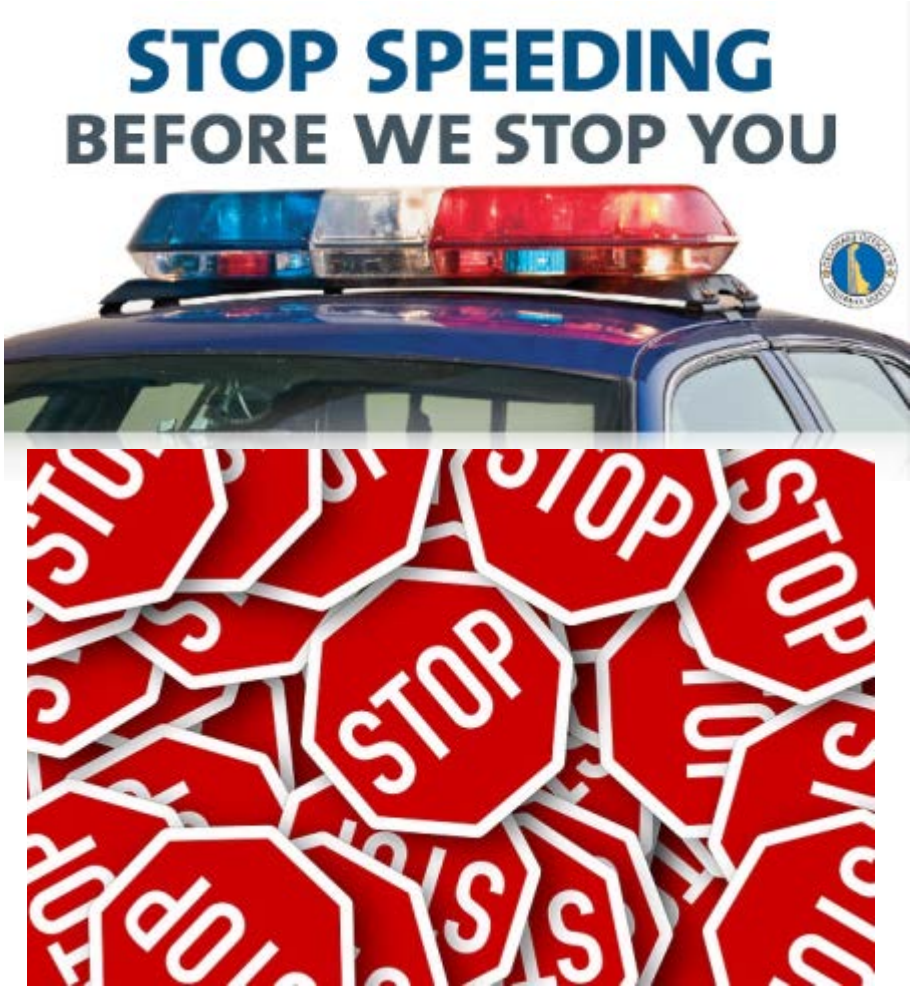
Agenda

- APS Update and Status Report
  - Safety
  - Operations statistics
  - Welcome your NSLS neighbors
  - APS 5-year Facility Plan Status
  - Work Breakdown Structure
  - Science Highlights
  - Technical Highlights
  - Hosting Foreign visitors
  - Awards
  - Upcoming Conferences and Meetings
  - APS Website Refresh
  - Pacesetters
- APS Upgrade Update – Stuart Henderson
- The APS Revolver Undulator for DCS – John Grimmer

Traffic Violations

- Have noted an increase in traffic violations by APS employees & users

- I expect everyone to:
  - Come to a complete halt at STOP signs
  - Stay within the posted speed limit – 30 MPH unless otherwise posted
  - Park in designated areas and not along the road (use new CNM lot across Kearney Road or the APS overflow parking lot by 401)
  - Wear helmets on both motorcycles and bicycles

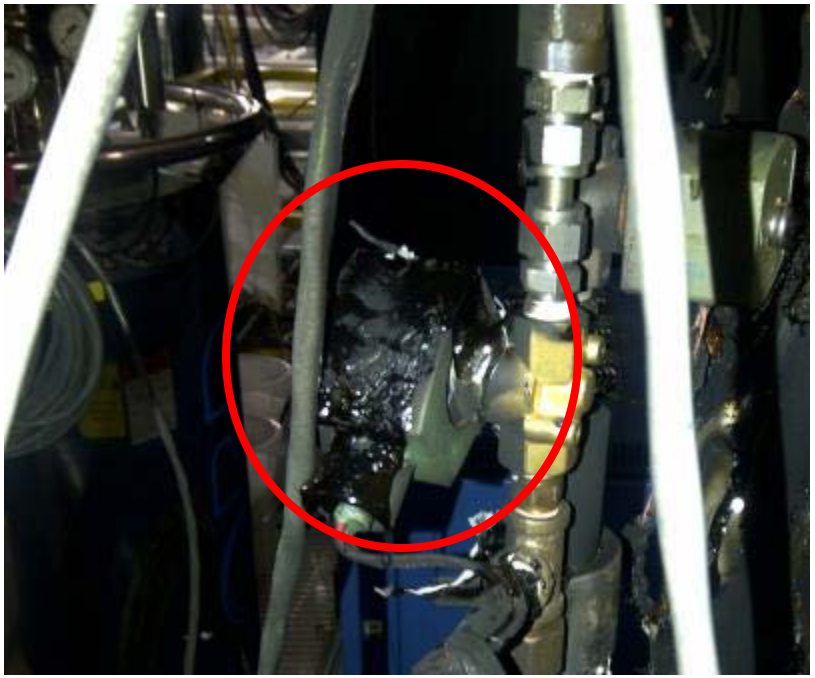


Reducing Hazardous Waste Saves Money

- Dynamic Compression Sector (DCS) studies the fundamental mechanisms governing time-dependent condensed matter phenomena (structural transformations, inelastic deformation and fracture, and chemical reactions) under dynamic loading.
- Some of the equipment that produces the dynamic loading utilizes smokeless gun powder.
- The residue from the smokeless powder and the solvents used to clean the equipment after each use was predicted to generate approximately 500 gallons of hazardous waste materials per year.
- Substitution of kerosene based gun bore cleaners (Hoppes 9) with a biodegradable cleaner (M-Pro 7) reduces the hazardous materials waste to ZERO.
- TCLP confirmed that the paper waste generated from the cleaning process (contaminated with the biodegradable cleaner, plastic particles, and spent smokeless powder residue) is not hazardous material waste and can instead be disposed of as regular trash.
- DCS will not need to pay hazardous waste disposal costs for these processes.

ESH

- Small fire occurred on 9/22/14 from Styrofoam ignited by heat from an energized solenoid on a local cryocooler system
  - 911 called
  - Put out using local extinguisher before Fire Department arrived
  - No evacuation or injuries
  - Very little damage
  - Not ORPS reportable
  - Extent-of-condition review performed

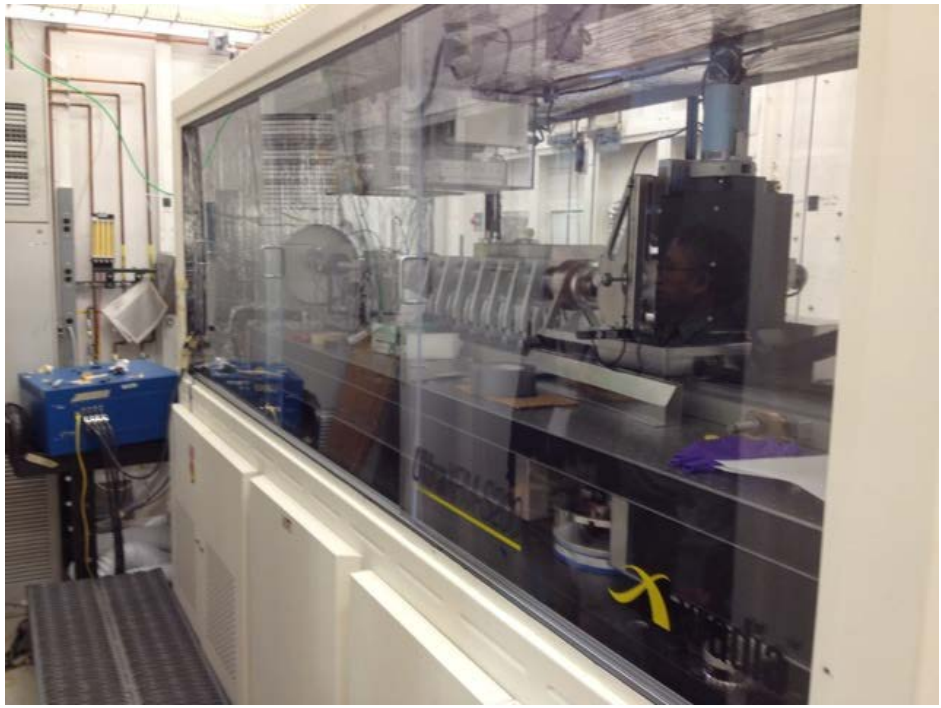


Operations Summary

- Run 2014-3, began October 1, 2014:
  - 9 faults for a total of 12.23 hours of downtime.
    - First week of run: 7 faults, most Oct 1-3.
    - No correlations among the trips nor signs of serious trouble
  - Availability = 97.81%; MTBF 60.64hrs (as of Oct. 29)

Support for NSLS staff and users

- **TXM:** First draft of MOU sent to BNL for locating the NSLS TXM at the APS. Sector 8 likely home.



TXM at NSLS

- **6-BM white beam line:** Plan agreed upon to operate 6-BM. Plan under review by COMPRES team.
  - COMPRES's large volume press (LVP) for high pressure work and energy dispersive diffraction experiments
  - Expect COMPRES to move the LVP from NSLS after shutdown. Will use 2014-3 for installation and commissioning and start GU program in 2015-1.

Support for NSLS staff and users

- **13-BM-C mono station:** GSECARS has been working with COMPRES to find a home for monochromatic DAC work (Partnership for Extreme Crystallography)
  - To accommodate the DAC program, GSE has installed a high-energy mono

- Two new full-time Research Scientist positions were created and the people hired in September. They will start toward the end of the year.

- Assembly and testing of the components needed for the laser heating setup in 13-BM-C began during the last two months.

- Commissioning parts of the system will begin in late November.

APS 5-Year Facility Plan

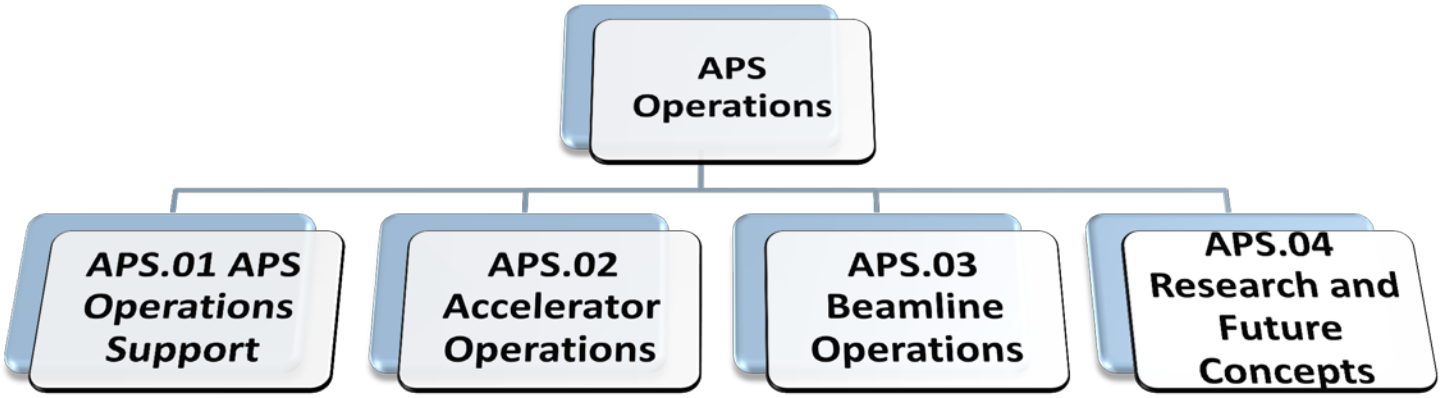
PAST

- June 21: Draft plan sent to APS Science Advisory Committee (SAC) for initial review
- June 24: Draft plan presented at the DOE-BES Triennial Operations review
- July 9: Discussion of draft plan with APS Users Organization and Partner User Council
- Comments from all meetings and further discussions being integrated into plan
- Beamline-by-beamline SWOT analysis completed

FUTURE

- October 29th: Final draft completed, sent to APS SAC
- November 5-6: APS SAC meeting for final advice
- November 10: Circulate to users and other stakeholders
- End of December: Post final plan online

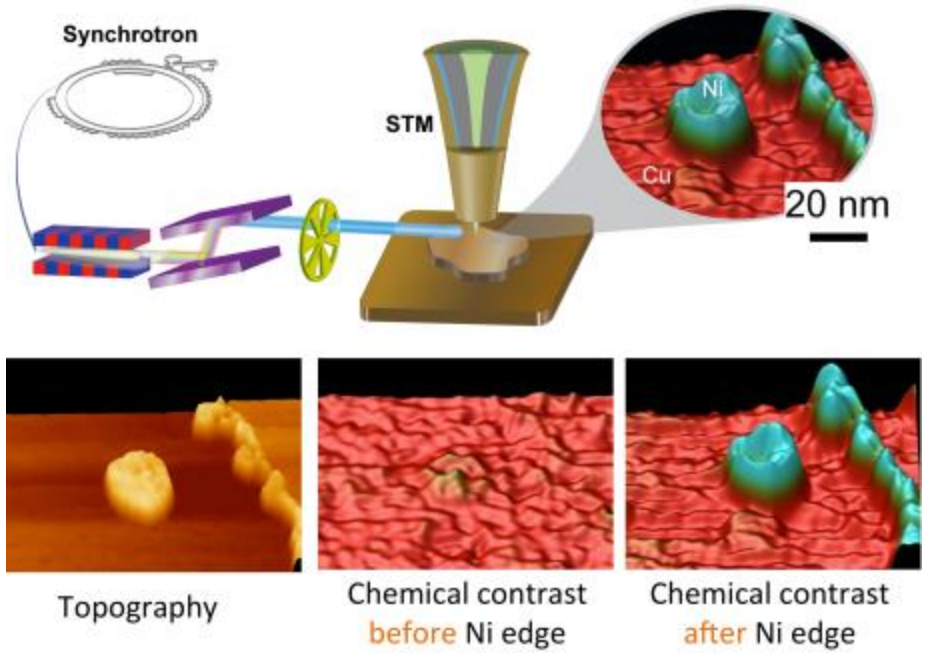
Work Breakdown Structure for APS Operations



WBS ELEMENT	WBS DESCRIPTION	CAM	CAM Division	Control Level
APS	APS OPERATIONS			Summary
APS.01	APS Operations Support	Srajer	PSC	Summary
APS.02	Accelerator Operations	Zholents	ASD	Summary
APS.03	Beamline Operations	Young	XSD	Summary
APS.04	Research and Future Concepts	Srajer	PSC	Summary

- WBS was successfully implemented on October 1, 2014
- Improvements are on-going: Change Control Board (Nancy, Connie and George)

Elemental fingerprinting of materials with sensitivity at the atomic limit



Localized X-ray cross-section of a Ni island. a, The sample current does not provide chemical contrast, when the X-ray energy (E = 8.25 keV) is below the Ni K-edge (8.33 keV). The Ni island on the Cu(111) terrace and islands along the Cu step edge become clearly visible for photon energies above the Ni K-edge, here E = 8.55 keV.

Scientific Achievement

Direct nanoscale chemical imaging of Ni islands on Cu(111) at *record-breaking* resolution

Significance and Impact

First time measurement of the photoionization cross section of a single nanocluster. So far, photoionization cross sections of materials were obtained as an average over a large surface area and also over a substantial x-ray probing depth. New technique yields cross sections with unprecedented localization.

Research Details

- Vertical resolution at the ultimate limit of a single atomic layer.
- Lateral resolution below 2 nm.

N. Shirato, M. Cummings, H. Kersell, Y. Li, B. Stripe, D. Rosenmann, S.-W. Hla & V. Rose, Nano Letters (2014), doi: 10.1021/nl5030613.

U.S. DEPARTMENT OF ENERGY | Office of Science

Work was performed at Argonne National Laboratory

Early Career Research Program SC70705

Argonne NATIONAL LABORATORY

APS-U Construction Status of 27-ID RIXS (Oct. 2014)

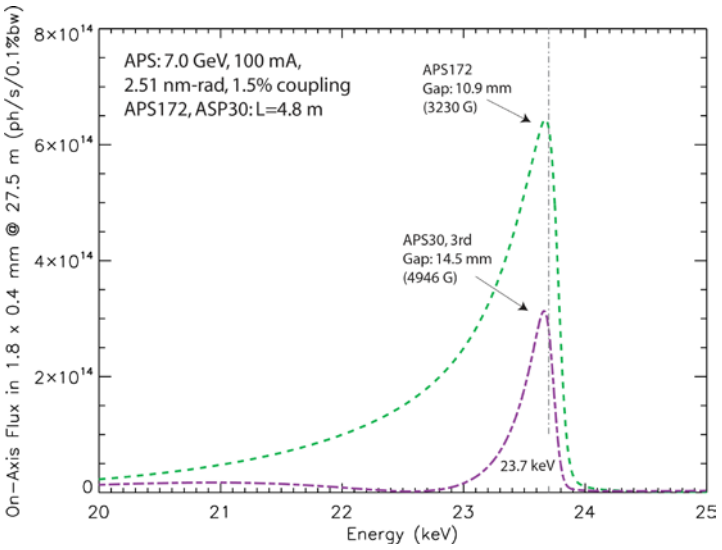
- On time, on budget
- In September, commissioned and characterized all white beam components.
- Proceeded to bring monochromatic beam into the experimental station 27-ID-B and achieved very good performance in regards to overall flux, beam size, divergence and throughput through a standard Si(844) high-resolution monochromator. All characteristics were equivalent or slightly better than those at 30-ID at the Ir edge.

- Relocated RIXS instrumentation from beamline 30ID to the new RIXS beamline 27-ID.
  - Re-assembly of the spectrometer has begun and is about 70% complete
  - High-resolution monochromator from 30-ID has been reassembled in 27-ID-B and is awaiting commissioning
  - New IDT KB-mirror system has been received and is currently undergoing its initial check-out

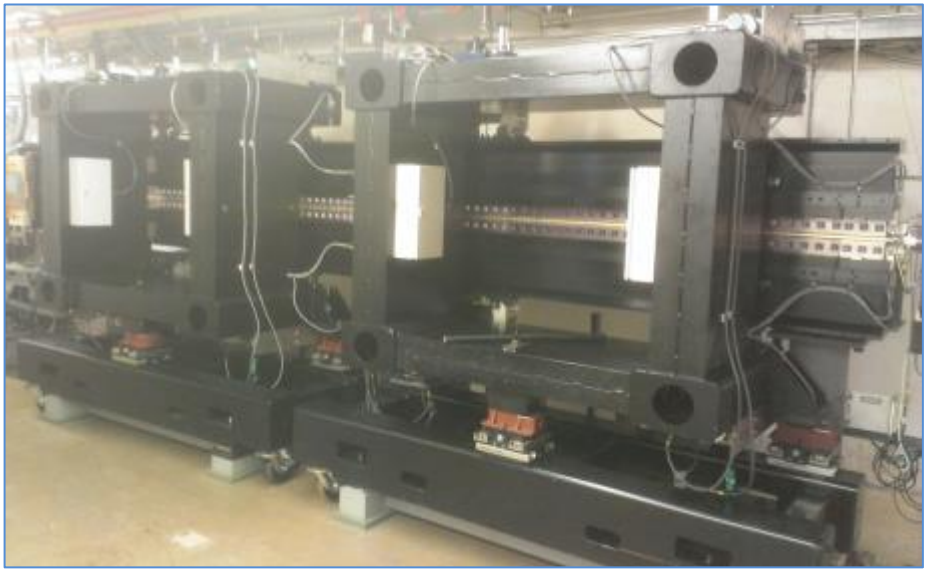
Technical Highlight:

Two 1.72-cm period undulators installed in Sector 30

- An undulator with a new period was designed as part of the APS-U "RIXS" beamline upgrade at Sector 27. The new undulator period is 1.72 cm, which is shorter than any previous APS-designed undulators. This period was selected to maximize photon flux at 23.7 keV.
- During August and September, 2014, two of the undulators were assembled, tuned and installed in Sector 30 for the "HERIX" beamline, and the two, 3.0-cm period undulators from Sector 30 were moved to Sector 27 (the actual RIXS beamline).
- The beamline scientists have already reported flux almost twice that of the previous 3.0-cm period undulators at 23.7 keV; the theoretical improvement is about 2.1 times.



Calculated flux gain 2.1 times

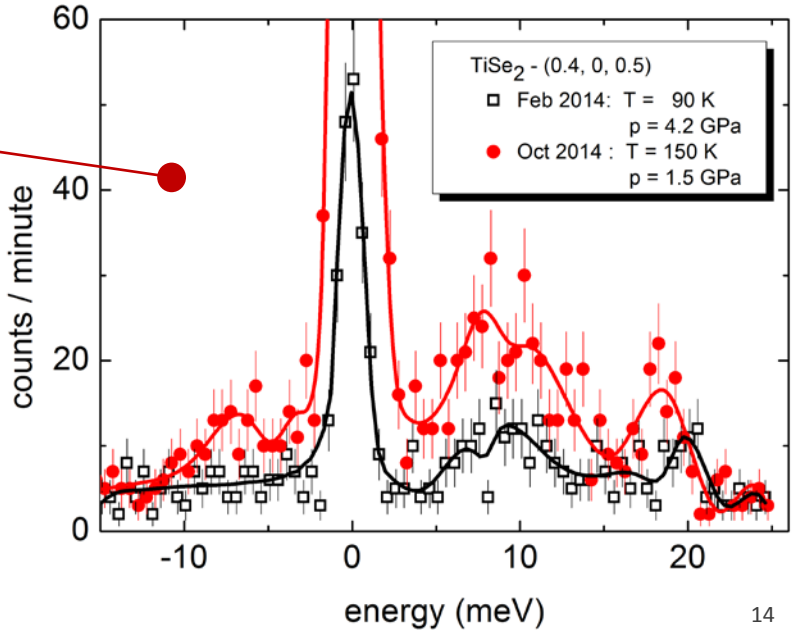


The undulators installed in Sector 30 of the APS storage ring, closed to their minimum gaps of 10.6 mm.

New Short-Period Undulators at 30-ID (Oct. 2014)

- Recent replacement of older 30mm undulators by new short-period 17.2mm undulators **doubles the incident flux**, **substantially improves the flux density and beam divergence** for the HERIX instrument
- Implementation of new undulators has an **immediate, significant impact on user operation** at 30-ID
- HERIX spectroscopy is extremely photon-hungry. Doubling the incident flux enables users to obtain publishable data sets within as little as one visit to the APS, instead of multiple visits.

Phonon spectra measured by current 30-ID general user on $TiSe_2$ under high pressure, before (**black curve**) and after (**red curve**) implementation of new undulators. New spectrum has doubled count-rate, improved signal to noise ratio and reveals structure not discerned previously

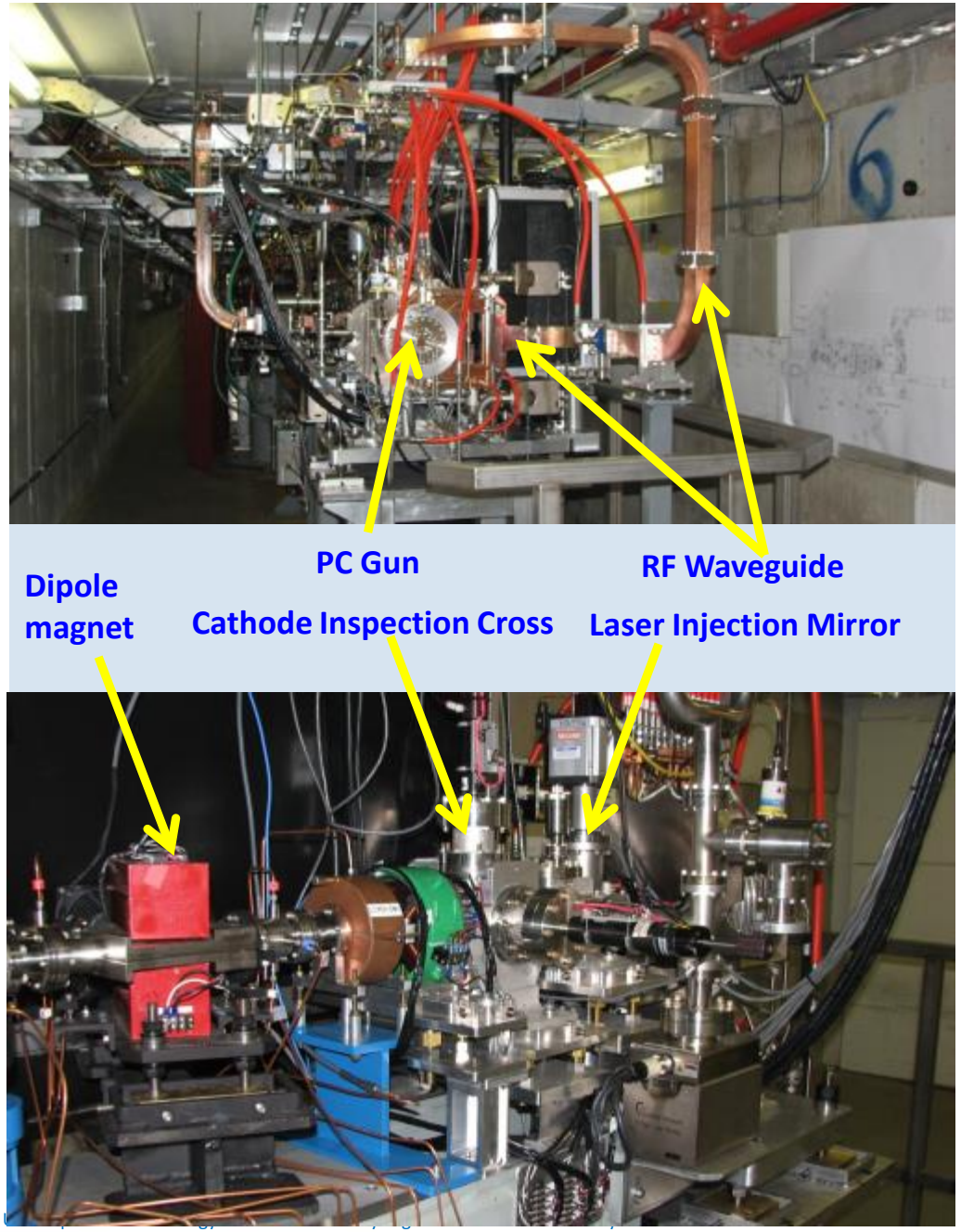


- **New opportunities:**
  - Thin films
  - Small samples under high pressure

Technical Highlight:

A new S-band photocathode RF gun was installed in the linac tunnel during the September 2014 shutdown period.

- Gun was baked at 150°C to improve the gun base vacuum.
- Gun assembly and downstream beam transport line components were surveyed and aligned.
- Ready for RF conditioning followed by commissioning with beam.



Hosting Foreign Nationals (DOE Order 142.3A)

DOE Order requires

- hosts listed in FAVOR (ANL)/FACTS (DOE) is the person most closely responsible for the work produce and performance of foreign national
- Hosts must have fulfilled host training

Award winning staff and users

Michael Borland, ASD associate division director**,** was one of four ANL scientists recently named as **Distinguished Fellows**, the laboratory's highest scientific and engineering rank.

Mark C. Hersam, a DND-CAT users and Northwestern University materials scientist has been named a **2014 MacArthur Fellow**.

He works across scientific disciplines to create new hybrid organic-inorganic materials, with a focus on the study of the electrical and optical properties of carbon and related nanomaterials.

Award winning staff and users

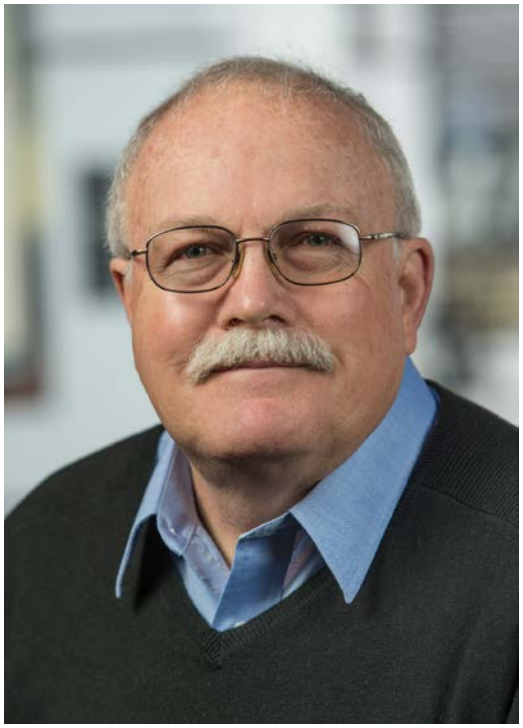
Peter Crane, professor of botany at Yale University, received the **International Prize for Biology** from the The Japan Society for the Promotion of Science for his work on the evolutionary history of plants.

The honor, which comes with a prize of 10 million yen, is awarded annually to individuals who have made outstanding contributions to the advancement of research in fundamental biology.
Crane is a long-time user of 2BM

Over more than three decades, Crane's work has integrated data from living plants with new discoveries from the paleontological record to provide critical insights into the early history of plants and how they shaped the modern biosphere.

Award winning staff and users

Randy Winans, ACS Division of Energy and Fuels
2014 Distinguished Service Award

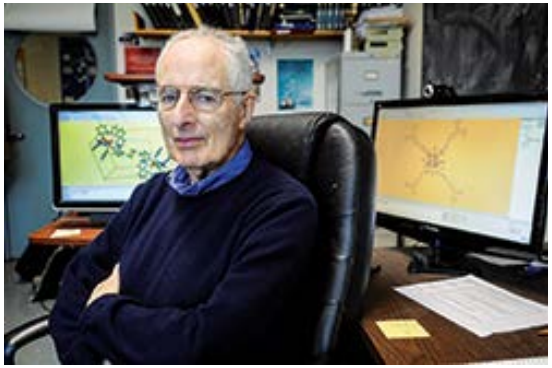


Randy's contributions to FUEL include Treasurer 1983-1985, Trustee 1987, Chair-Elect 1988, Chair 1989, Past Chair 1990, Chair, Strategic Planning Committee 1993-1995, Director-at-Large 1995-1998, Chair of the Ad Hoc Committee to monitor Energy & Fuels 1994, and symposium chair of several national meeting symposia. He served on the FUEL/PETR Merger Committee on both the Awards and Finance Subcommittees and continues to serve the ENFL as Webmaster and Chair of the Awards Committee. He has also been on the Editorial Board for the ACS Journal Energy & Fuels since 1994 and the Elsevier journal FUEL since 1995. Randy was the awarded the first ACS Fellows honor for FUEL for his scientific and ACS contributions and the Distinguished Service Award by the FUEL Division in 2006.

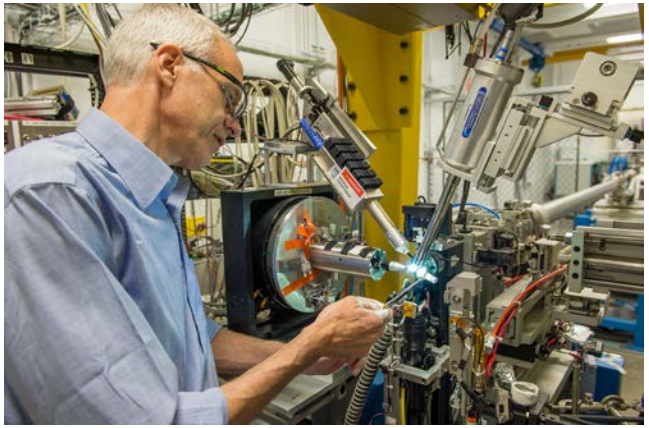
Award-winning crystallography work

To celebrate the International Year of Crystallography, *Chemical & Engineering News* staff selected the top 10 most important discoveries in that field. APS users earned two of those spots.

- **Setting the stage for X-ray crystallography to study dynamics:** Distinguished Research Prof. of Chemistry **Philip Coppens** (U. Buffalo SUNY, ChemMatCARS) through his 1994 research on nitroprusside ion. In 2002, he reported the first X-ray crystallographic excited-state structure: binuclear platinum ion, which was observed through work at NSLS and the APS.



Philip Coppens, from C&E News by Nancy Parisi/U at Buffalo SUNY



Brian Kobilka using the micro-beam at GM/CA

- **Structure of GPCR membrane protein with its signaling partner:** Stanford **University's Brian Kobilka** conducted nearly all of the X-ray work at GM/CA at the APS, where the nation's first micro-focused X-ray beam was developed, in large part, to aid his research.

Conferences and Workshops

- Next DLSR Workshop being planned for November 19-21 2014, to be held at Argonne

- NSLS is hosting the *12th International SRI Conference* in NYC on July 6-10, 2015.

- 18th International Conference on Accelerators and Beam Utilization (ICABU 2104), week of November 10th, 2014

- Starting to plan for 2015 Users Meeting

Geobiology Geochemistry Energy Climate Change

SES VI

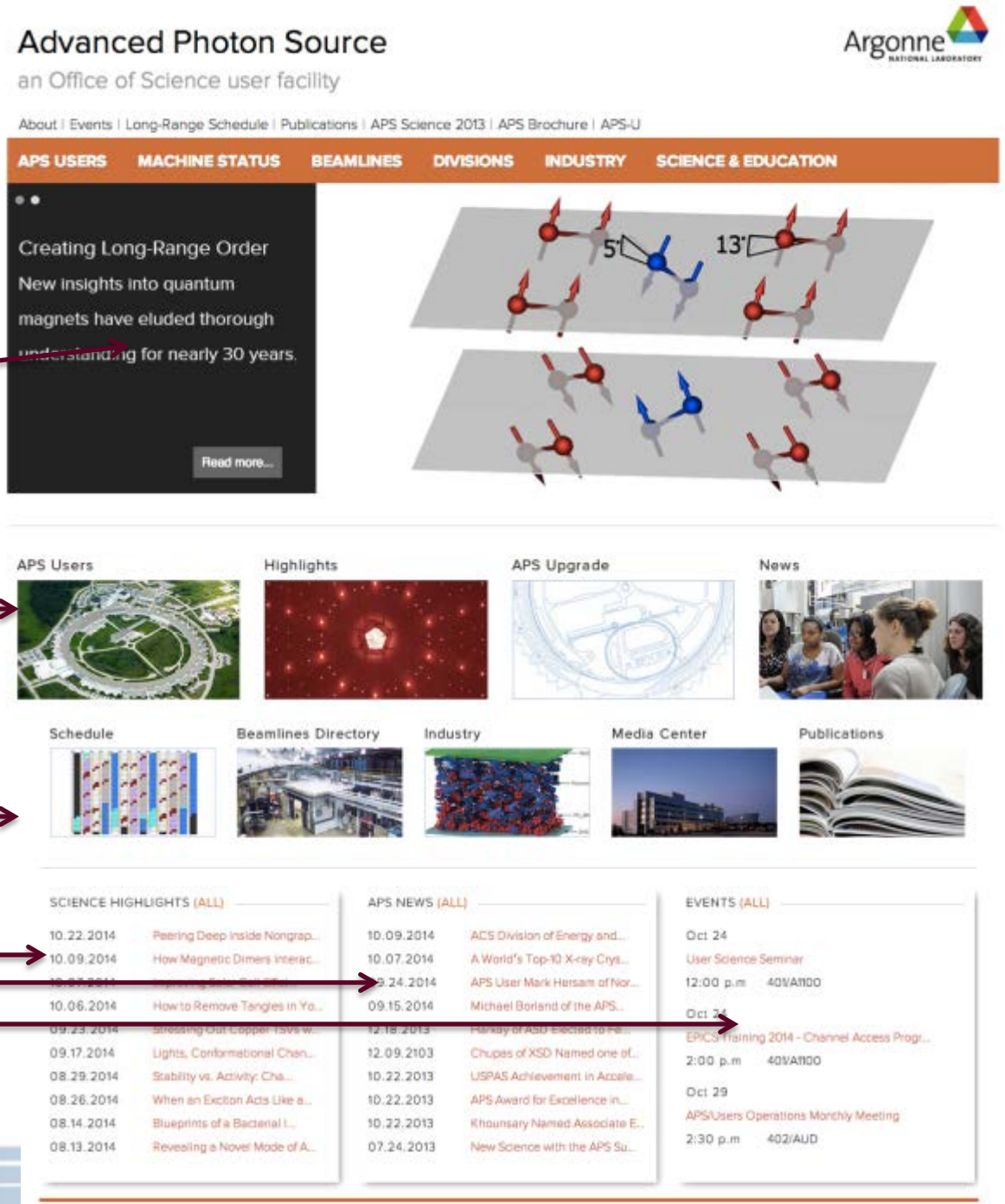
Website Refresh

Rotating banner images, drawing attention to recent science highlights.

Primary Buttons of Interest

Secondary Buttons of Interest

Latest Highlights, News, and Events from the APS.



CAT participation optional

The change over will only affect APS-controlled webpages.

If CATs would like to switch to the new format, AES staff will help with the changes.

- To discuss moving a CAT website to the new format, contact Kelly Cunningham

Roll Out Timeline

- Early November: roll out homepage
- Jan. 8: Users Office homepage
- Feb. 2: Upgrade Office homepage
- March 12: Division homepages and a list of groups

Pacesetter Awards
Marvin Kirshenbaum (AES), and Randall Mirabelli (FMS)

This award is presented in recognition of the Outstanding Effort by Marvin and Randall in their investigation and analysis of Chilled Water Distribution System resulting in significant operating cost savings to Argonne and providing the Laboratory with a new tool to further analyze system operation, improving reliability, lowering operating costs, and enhancing site sustainability.

Pacesetter Awards
Paul Rossi (XSD), Olaf Borkiewicz (XSD), Darryl Reigle (AES), Pete Jemian (AES), Troy Lutes (AES)

This award is presented in recognition of the Outstanding Efforts to research and develop cost-effective electronic poster displays for the beamlines at the Advanced Photon Source.

Pacesetter Awards
Richard Diviero (AES), Marty Smith(AES), and Andy Stevens (AES)

This award is presented in recognition of the Outstanding Effort in managing, designing, and implementing the LNDS upgrades and for completing both projects on schedule under difficult time constraints, while avoiding significant disruptions to APS's operations and to the existing LNDS.

Director's Award Recipients

Susan Bettenhausen (ASD),
Guy Harris (AES),
William Jansma (AES),
Aaron Lopez (AES),
Raul Mascote (AES),
Glenn Moonier (AES), and
Scott Wesling (AES)

Extraordinary effort in assembly and alignment of the first APS Superconducting Test Undulator (SCUO) resulted in this additional award and recognition by Argonne's Laboratory Director to these Pacesetter Award recipients.