

PSC ALL-HANDS MEETING JANUARY 24, 2018



STEPHEN STREIFFER

Associate Laboratory Director, Photon Sciences
Director, Advanced Photon Source

AGENDA

- APS-U Update (R. Hettel)
- Safety (S. Streiffer)
- PSC News & Updates (S. Streiffer)
- Annual User Survey Results (D. Mills)
- Infrastructure Update (G. Srajer)
- Questions
- Adjourn

SAFETY

- Rescinded compensatory requirements to perform Mode 0 and 1 electrical work
 - Electrical work observers no longer required
 - Pre-job and post-job briefings will continue
- Changes to Argonne Electrical Safety Program
 - New Electrical Safety Manual to take effect on 1 February, 2018
 - QEW training will be modified to include more practical performance
- DEEI Inspection Request System
 - Allow staff and resident users to request a DEEI inspection
 - Available through Vector by February 1, 2018
- Experimental authorization for 2018-1 run
 - Electrical walkthroughs of beamlines and labs in progress
 - Experimental check-lists only required if users will be present
- Developed, deployed new Pre-Job Briefing solution built on scalable MVC architecture; new solution authentication activated, has advanced search
- Developed and deployed ServiceNow solution for Designated Electrical Equipment Inspection requests
- **WINTER ISN'T OVER: WATCH OUT FOR ICE!**

PSC UPDATE

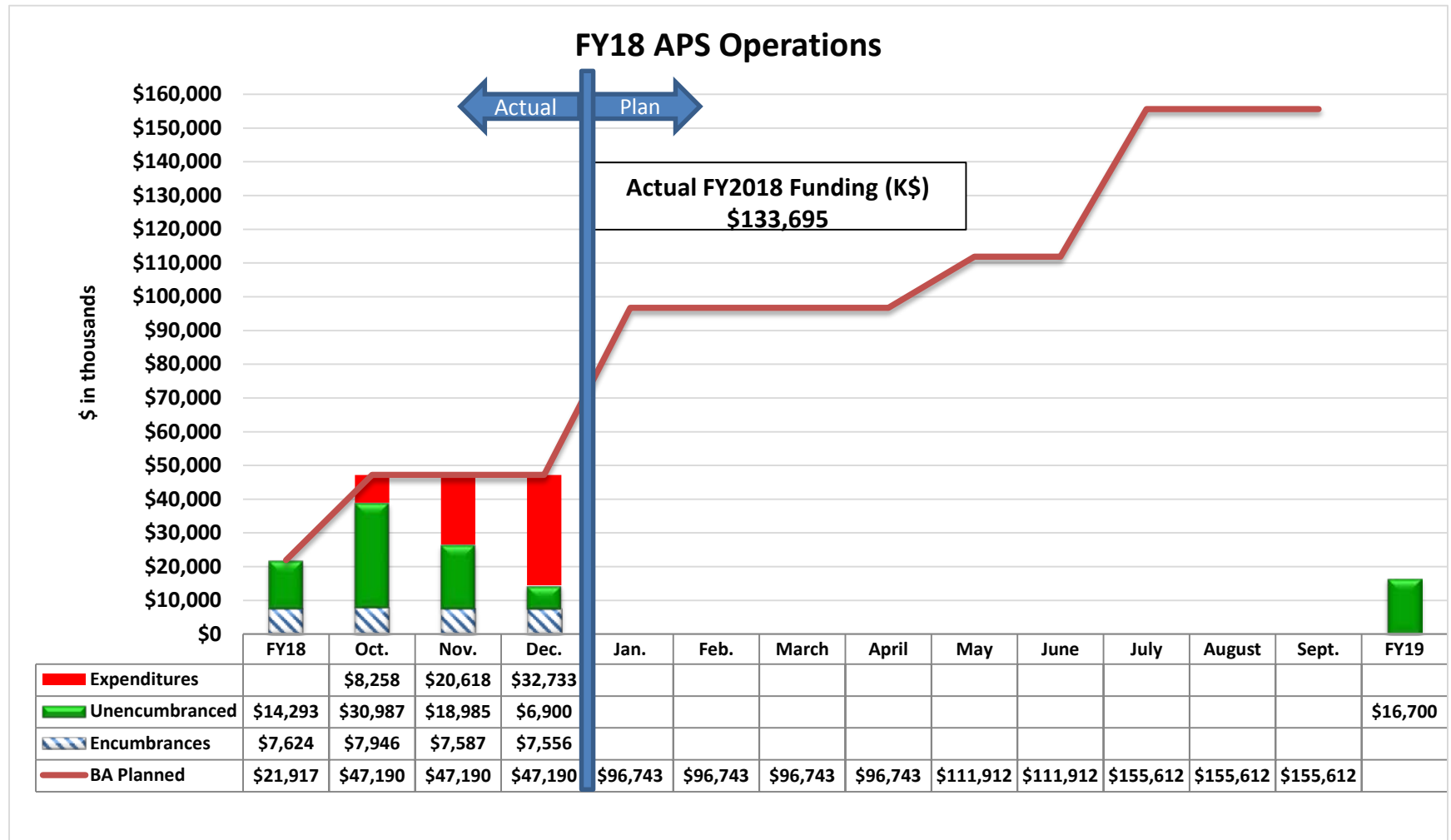


GOVERNMENT SHUTDOWN: UPDATES

- Situation: **Fluid!**
- Continuing resolution through February 8
- Then: Stay tuned (to the APS Website)



APS OPERATIONS – FY18 BUDGET: PLANNED VS ACTUAL SPENDING



CR funding at 30.4% or \$40.6M will take us through March 4 with ~\$1.4M unencumbranced funds

BES Triennial Review of the APS

- BES Triennial Review was held Tuesday, August 15 to Thursday, August 17, 2017
- Review report received on November 29, 2017. The reports (76pp) are very positive, while still noting areas for improvement.
 - “The APS appears to be performing very well. Staff is highly motivated, experienced, and knowledgeable.”
 - “As the largest synchrotron facility in the US, the scientific output of APS is outstanding, and its impact on science is profound.”
 - “The APS facility has been exceptionally productive – in quantity and quality of publications and other measures from the facility and CAT beamlines; the accelerator operations has been with excellent reliability, and the number of users is very high and continues to grow. APS is to be congratulated for these excellent achievements.”
 - “The APS accelerator team has a strong international reputation for accelerator research, in particular for their computational simulation capabilities, superconducting undulator development, solid state RF and beam stability/feedback.”
 - “There is a challenge in the extensive matrixing of staff, in particular between the APS and APS-U, and management needs to ensure that both activities prosper in parallel until the APS-U is complete.”
- Five recommendations to address on staffing skill distributions, continuing to find efficiencies in operations, cost structure, LDRD activities, and safety

NEXT 5-WAY DIRECTORS' MEETING HOSTED BY ALS ON APRIL 23, 2018

Draft Agenda

- | | |
|--|-----------------------------------|
| 1. Data | TBD |
| a) initial report out from data working group | |
| b) analysis and CAMERA update | |
| 2. Update on Shared Business Software | D. Mills / S. White De Pace (APS) |
| a) Portals | |
| b) ORCID issues | |
| 3. Optics Updates | TBD |
| a) cryo-cooled mirrors | |
| b) diffractive optics fabrication | |
| 4. Detectors Updates | P. Denes (LBNL) |
| a) CCD/CMOS/etc | |
| b) channel plate/CMOS | |
| 5. APS-U Dark Period | D. Mills (APS) |
| a) Revisit spreadsheet, bioscience report, etc. | |
| b) What could we do with a little \$\$ to get ready? | |
| 6. Workforce Development | S. Kevan (ALS) |
| 7. Beam Stability Workshop Update | G. Srajer (APS) |

NEXT 3-WAY MEETING TO BE HOSTED BY APS

- The 3-Way Meetings are organized and attended by staff from the four high-energy storage ring sources (APS, ESRF, PETRA III, and SPring-8) from the three continents of Asia, Europe, and North America
- These meeting, set up to facilitate discussions and collaborations between facility staff, have played a central role as a collaborative framework for discussing various scientific and/or technological issues as challenges for the four high-energy, large-scale, third-generation synchrotron radiation facilities
- The 17th 3-Way Meeting will be hosted by the APS at Argonne on May 3 and 4, 2018 (the Thursday and Friday before the Annual User Meeting)
- The agenda is under development

USER MEETING WORKSHOPS

▪ **APS Workshops:**

- Workshop on Past, Present, and Future of Insertion Devices at the APS: A Tribute to Efim Gluskin, Emil Trakhtenberg, and Isaac Vasserman; organizers: Dennis M. Mills, Yury Ivanyushenkov, and E. Ercan Alp (APS/ANL)
- High-Resolution 3-D X-ray Imaging; organizers: Si Chen, Doga Gursoy, Vincent de Andrade (APS/ANL)
- Resolution@Speed: Advanced X-ray Spectroscopies with Upgraded APS; organizers: Chengjun Sun and Anne Marie March (APS/ANL)
- Frontiers of Materials Research with Single-Crystal Total Scattering; organizers: Stephan Rosenkranz and Douglas Robinson (APS/ANL)
- Applications of Synchrotron X-ray Techniques for Studying Metal Additive Manufacturing; organizers: Tao Sun and Andrew Chuang (APS/ANL)

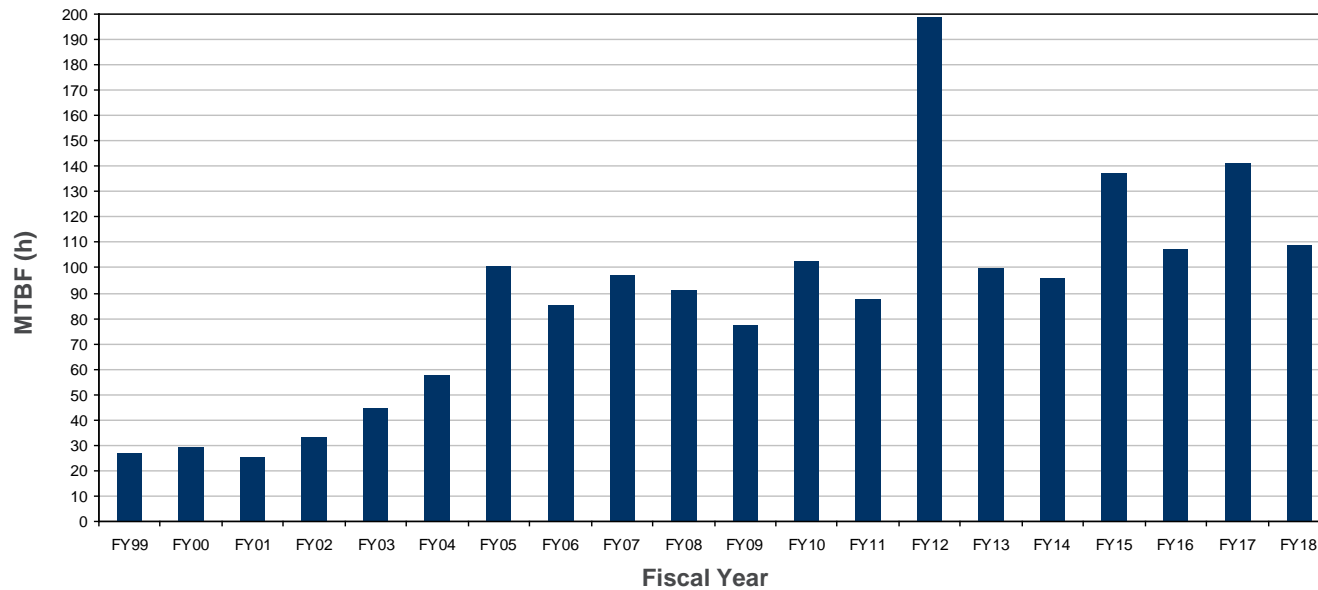
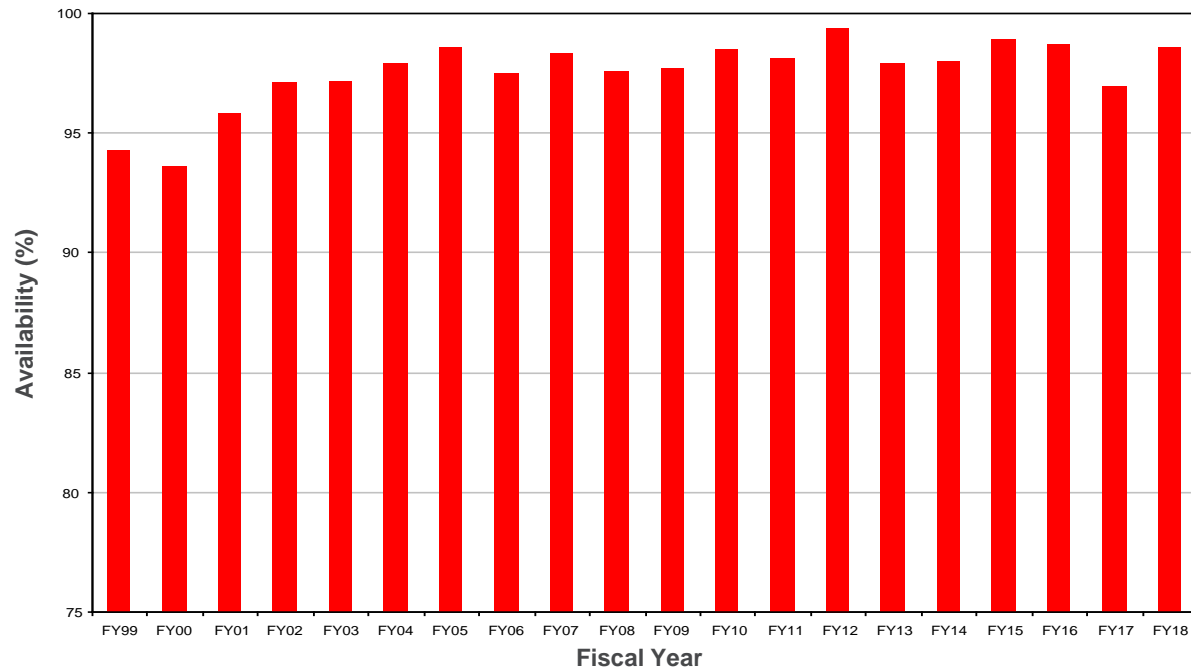
▪ **Joint APS/CNM Workshops:**

- Tipping X-ray - Comprehensive Nanoscale Characterization with Multimodal X-ray Imaging; organizers: Haidan Wen and Volker Rose (APS/CNM/ANL)
- *In situ* Rheology, SAXS, and XPCS for the Study of Soft Matter; organizers: Xiao-Min Lin (NST/ANL), Suresh Narayanan, and Alec Sandy (APS/ANL)

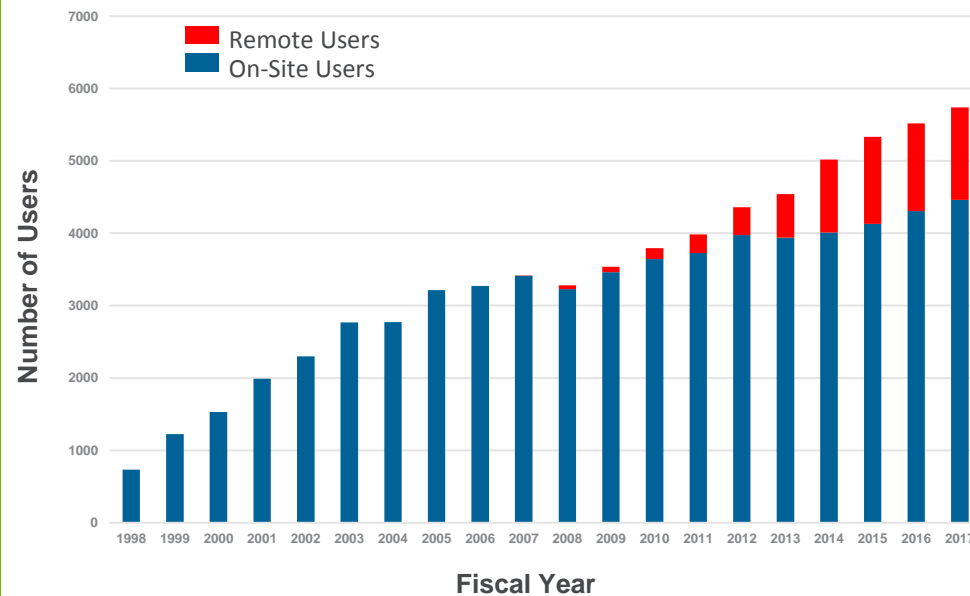
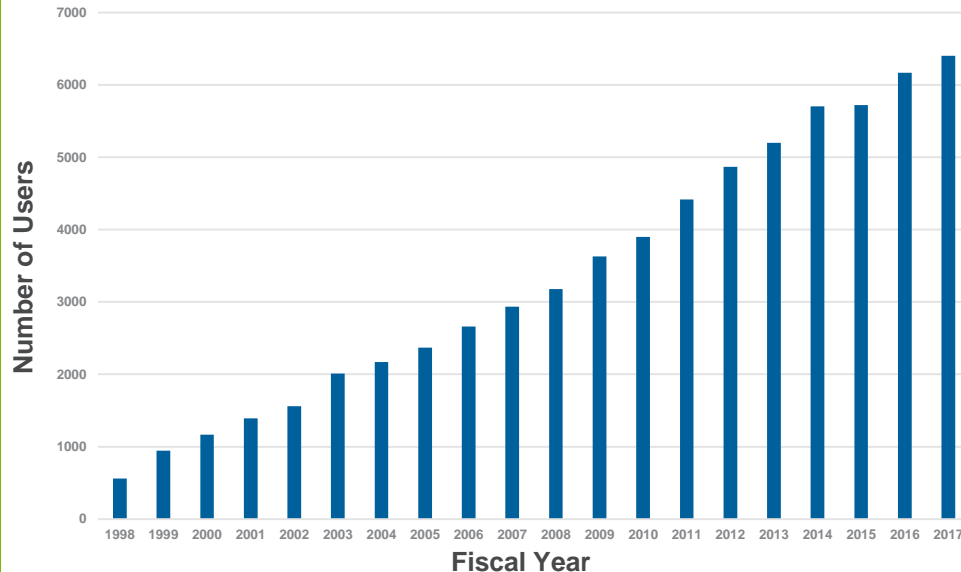
▪ **CNM Workshops:**

- Next-Generation Quantum Systems Based on Topological Phases and Integrated Quantum Photonics; organizers: Xuedan Ma and Dafei Jin (CNM/ANL)
- Nanoscience for Quantum Science: Developing, Characterizing, and Harnessing Optically Active Defects; organizers: Jeffrey Guest, Stephen Gray, Xuedan Ma (CNM/ANL)
- Tribology of 2-D Materials: From Nanoscale to Macroscale; organizers: Anirudha V. Sumant (CNM/ANL), Ali Erdemir (ES/ANL), and Subramanian Sankaranarayanan (CNM/ANL)

APS X-RAY AVAILABILITY AND MTBF: FY99-FY18 (RUN 17-3)



THE APS IS THE U.S. DOE'S MOST-USED LIGHT SOURCE



In FY2017:

- >23,000 visits by >5700 unique users
- >6400 experiments
- >1200 protein structure deposits; (>21,000 total to date – next closest in U.S. is NSLS(II) w/>8000; next closest in Eur. is ESRF w/>13,000; next closest in Asia is SPring-8 w/>4700)
- 68 operating beamlines, 5,000 hours
- >180 (unique) industrial users in FY16 from pharma, energy, electronics, materials...
- >21,800 (to date) journal publications; >21% in high-impact journals (>27,000 total publications)

*Prior to FY14, mail-in users were not included in the Remote category

PSC D&I Working Group (WG) Update

- Thanks to outgoing co-Chair Patricia Fernandez for her work the last 4 years on the Lab's D&I working group, and helping to kick-start APS D&I WG
- Thanks to co-Chair Rebecca Bradford for kick-starting D&I WG; staying on as co-Chair
- Welcome to new co-Chair Stefan Vogt
 - Co-chairs serve two-year alternating terms
- **Past accomplishments** are wide-ranging, including:
 - PSC-wide workshops on inclusive leadership, well attended (~1/3 of APS staff)
 - Increased clarity in promotion guidelines, etc. (POC-HP -> CHP)
 - APS groups poster series
 - Extended opening hours for west gate (daycare pickup)
- **Next steps:**
 - Take stock
 - Refine mission and vision for D&I WG (Lab group undergoing similar process)
 - Identify specific goals for FY18
 - Suggestions to:
 - rbradford@aps.anl.gov
 - svogt@anl.gov



Bradford



Fernandez



Vogt

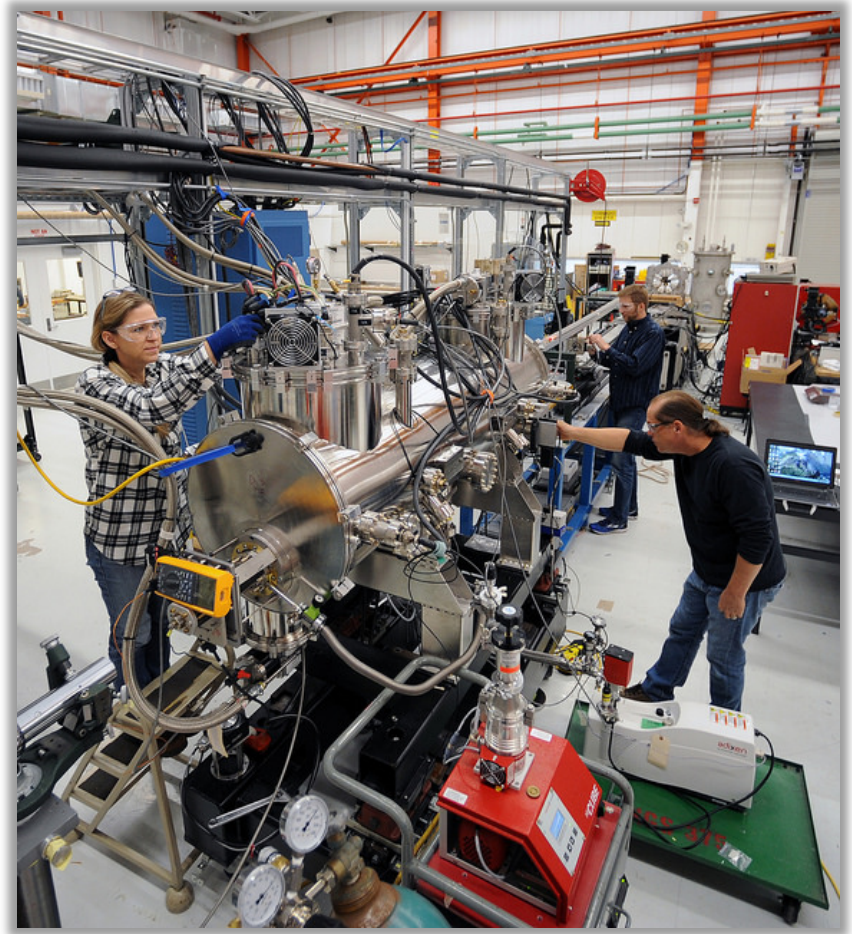
D&I Share

What are aspects of inclusion ?

- Respect co-workers:
 - Gender, race, religion, etc. cannot be a factor in how we respect the opinions of our co-workers
 - But do or should seniority, degree, position matter?
- To get the best out of team, make sure all contribute independent of any of the above (it may be difficult for people to contribute effectively when there are differences in seniority, etc.)
 - Make sure folks on your team are on board and have no concerns
 - Create an atmosphere where people feel comfortable asking questions and providing suggestions
 - Good idea to ask for input or better ideas about doing the work, etc.



TECHNICAL UPDATE



HELICAL SUPERCONDUCTING UNDULATOR (HSCU)

➤ All installation and performance milestones have been achieved

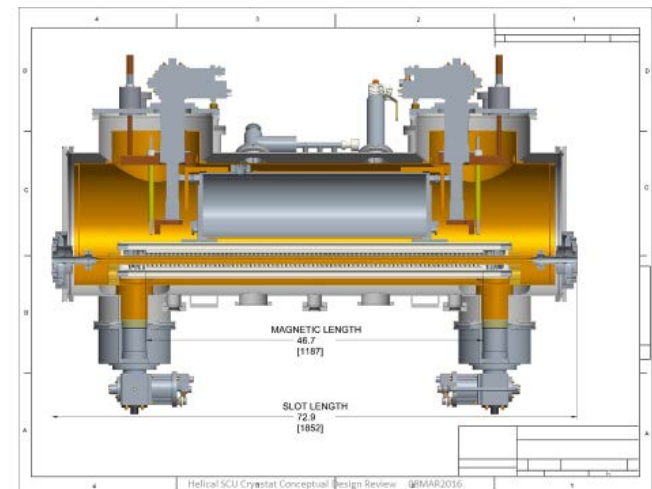
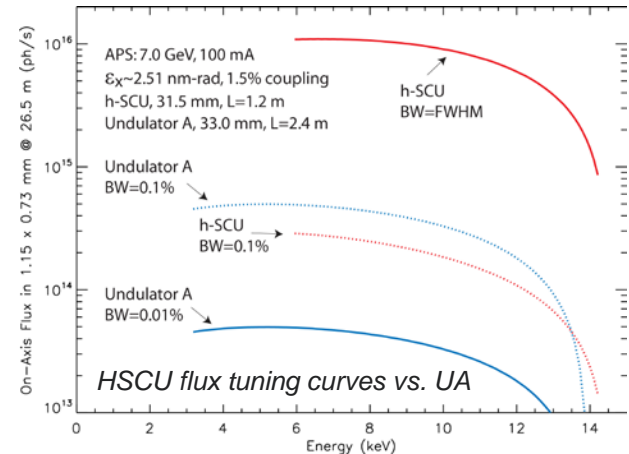
▪ HSCU has been a team effort including:

- AES/MED, SA, MOM, MOM/Vacuum, CTRLS, DD
- ASD/MD, PS, AOP, MCR
- XSD/TRR
- ANL/Infrastructure Services, ANL/HSE

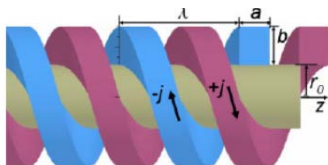
▪ SCU technology offers the possibility of building elliptically polarizing helical superconducting undulators

▪ We have recently completed and installed the world's first HSCU; funded separately by BES

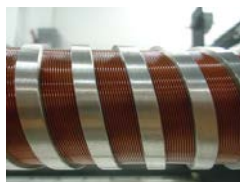
▪ X-ray photon correlation spectroscopy program at the APS will benefit from the increased brilliance provided by an HSCU



HSCU second-generation high-efficiency cryostat



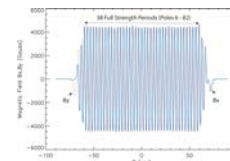
Magnetic model of HSCU



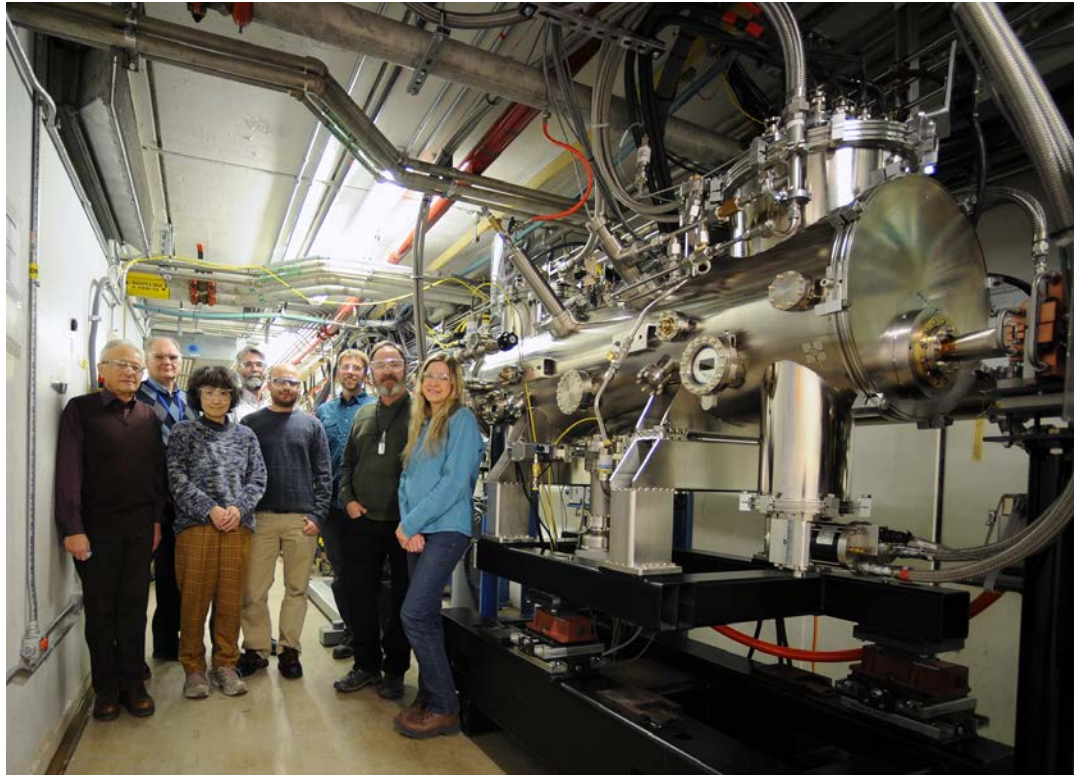
HSCU prototype coil winding



Machining of a helical SCU core



WORLD'S FIRST HSCU SUCCESSFULLY COMMISSIONED IN APS



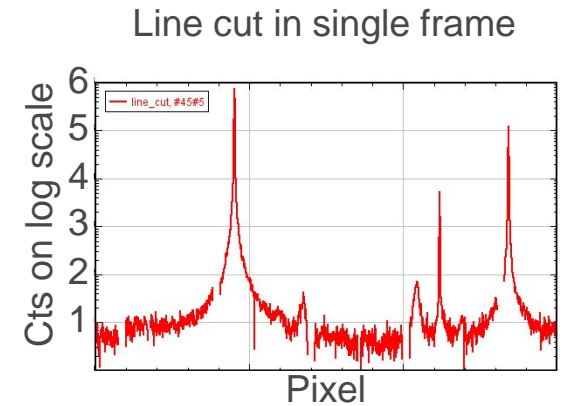
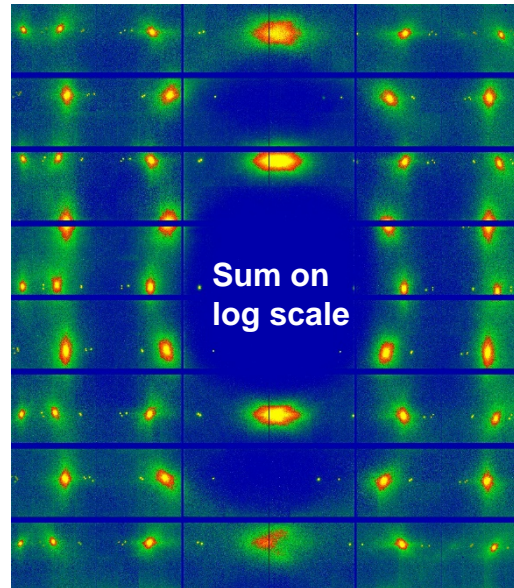
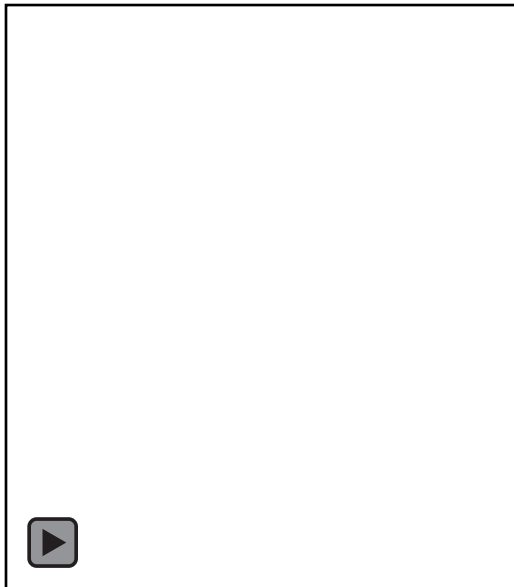
HSCU team: l. to r.: Efim Gluskin, Yury Ivanyushenkov, Yuko Shiroyanagi, Joel Fuerst (**Project Manager**), Ibrahim Kesgin, Matt Kasa, Quentin Hasse, Susan Bettenhausen

- Following successful installation over holiday shutdown, HSCU saw first beam on 19 January
- First injection with beam shows extremely good alignment of HSCU vacuum chamber
- Unexpected heating with beam at 80 mA observed
 - After many discussions, main suspect is heating of magnet body from high-energy x-ray tail from upstream dipole penetrating the vacuum chamber
 - Applying beam steering in 7-BM, heating returns to expected levels
- HSCU now operates at full current (450 A) and at nominal beam current (100 mA)
- **Ready to send light to users!**

HIGH-ENERGY PILATUS3X 2M CdTe

- Quantum Efficiency:
 - 90% @ 60 keV
 - 56% @ 100 keV
- Available for experiments at 1-ID, 6-ID-D, 11-ID

Test at 11-ID-C: Single crystal of shape memory alloy NiFeCoGa



$E_{\text{Photon}} = 106 \text{ keV}$

AES/IT: X-RAY BEAMLINE SERVERS AND STORAGE

- 2015 marked beginning of project to virtualize beamline servers and storage
- Currently, 80+ virtual machines (VMs) support XRAY and CAT beamlines
- 12 hypervisors (physical hosts for virtual servers)
- In 2017, the following upgrades and improvements were installed:
 - HP 3Par storage was upgraded with double the storage space, 2 additional controller nodes
 - 3Par storage is now in “Best Practice” 6-9s configuration
 - NetApp appliance was upgraded to four controller nodes to provide better performance, higher uptime
 - Storage capacity more than doubled
 - New virtual cluster added for beamline data management service, better performance, more resources
- Virtual system network being upgraded to multiple 40-Gbits/sec uplinks



NetApp FAS-8040
Storage System



HP C7000 Blade
Server System



HP 3Par Storage Array

PERSONNEL SAFETY SYSTEM UPGRADES

- Completed upgrade of all PSS Systems
 - PSS now monitors emergency egress buttons on manual doors to prevent start of search unless egress button is in reset position
 - Station search cannot begin unless shutter local operation key is in normal mode
 - RSI relay stuck “ON” warning

ACIS UPGRADES

- Continuing with design of new ACIS-U
 - Creating and reviewing operational and functional specifications, validation and commissioning procedures and drawings

FEEPS

- Working with MOM Group to remove VAT chassis, fast valve and changing valve control solenoid operation from pulsed control to maintained control
- Finalizing design of FEEPS upgrades for all BM systems, will begin implementation next shutdown

LASER INTERLOCKS

- Designed, fabricated, installed, tested new laser interlock system at 7-ID-B



AES SPP: LCLS II VACUUM CHAMBERS IN PRODUCTION

- After successful completion of LCLS vacuum chambers in 2007, Argonne tasked with building all vacuum chambers for two undulator lines featured in LCLS II Upgrade
- Argonne will deliver 26 chambers of one type for the soft x-ray undulators and 39 chambers of another type for the hard x-ray undulators by completion of the project in August 2018
- Collaborative effort of several Argonne groups, esp. AES/MED and AES/MOM



AES/IT, PSC COMMUNICATIONS & INFORMATION: APS WEB SITE

- Conversion of public web content to Drupal complete by 1/15/18
- Moving www.aps.anl.gov to Acquia cloud-based hosting service
- Migration of internal site to Drupal ongoing
- Redesign in progress

Advanced Photon Source
An Office of Science National User Facility

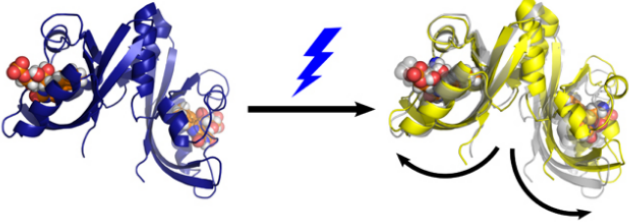
Argonne
NATIONAL LABORATORY

About Safety Divisions APS User Info APS-U Machine Status Beamlines Media

Long-Range Schedule Industry "APS Science" APS Brochure Science Highlights Publications APS/User News Useful Links Search Directory

Light Can
Make Things Happen

Research at the U.S. Department of Energy's Advanced Photon Source opens the door to bioengineered proteins that are responsive to light.



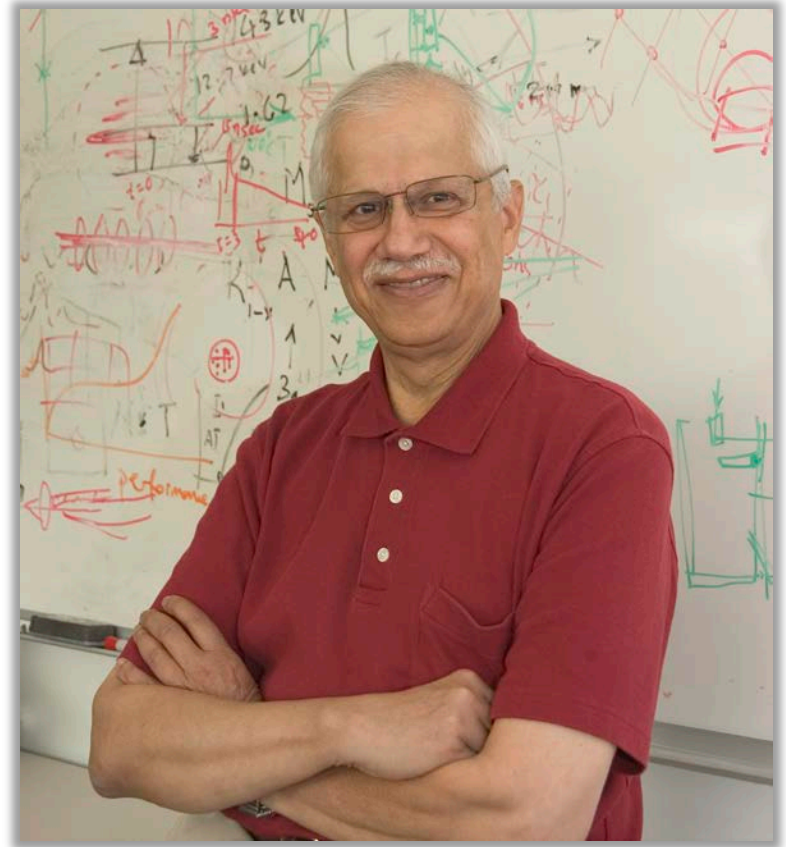
Read more...

APS/User News
In Memory of Joe Arko

GOPAL K. SHENOY

EXCELLENCE IN BEAMLINE SCIENCE AWARD

- The APS User Organization's Beamline Scientist Award, begun in 2013, has been renamed the **Gopal K. Shenoy Excellence in Beamline Science Award** in honor of the late Gopal K. Shenoy, a founder of the APS



DCS IN *SCIENTIFIC AMERICAN*

■ “Watching How Rare, Meteoric Diamonds Form”

- “In a first-of-its-kind collision chamber at Argonne National Laboratory, physicist Yogendra Gupta of Washington State University and his colleagues mimicked a meteorite impact by firing a lithium fluoride bullet at a graphite disk at 5.1 kilometers per second. Extremely bright x-rays ‘photographed’ the event at 150 billion frames per second.”

December 25, 2017

<https://www.scientificamerican.com/article/watching-how-rare-meteoric-diamonds-form/#>

The image is a screenshot of the Scientific American website. At the top, there is a navigation bar with a 'SUBSCRIBE' button, the 'SCIENTIFIC AMERICAN' logo, and links for 'English', 'Cart', 'Sign In', and 'Register'. Below this is a secondary navigation bar with categories: 'THE SCIENCES', 'MIND', 'HEALTH', 'TECH', 'SUSTAINABILITY', 'EDUCATION', 'VIDEO', 'PODCASTS', 'BLOGS', and 'STORE'. The main content area features the article title 'Watching How Rare, Meteoric Diamonds Form' under the 'CHEMISTRY' category. A subtitle reads 'A shock collision experiment maps their transition from graphite in real time'. The byline is 'By Bethel Beckwith on December 25, 2017'. The main image is a photograph of Meteor Crater in Arizona. To the right of the main image is a 'READ THIS NEXT' section with three article thumbnails: 'The Labs That Forge Distant Planets Here on Earth', '2-Dimensional Materials Create New Tools for Technologists', and 'Nothing Says "Early Earth Was Cool" Like World's Oldest Diamonds'. Below the main image is a short introductory paragraph. Further down is a longer paragraph describing the experiment at Argonne National Laboratory, mentioning physicist Yogendra Gupta and the use of a lithium fluoride bullet at 5.1 km/s. The final paragraph is a quote from Gupta about the transition from graphite to diamond.

GM/CA-XSD IN WIRED

- **“Scientists Just Solved a Major Piece of the Opioid Puzzle”**

- “... report for the first time the structure of the kappa opioid receptor while it's bound to a drug molecule, a discovery that could accelerate the discovery of less-addictive—and less deadly—opioids.”

January 8, 2018

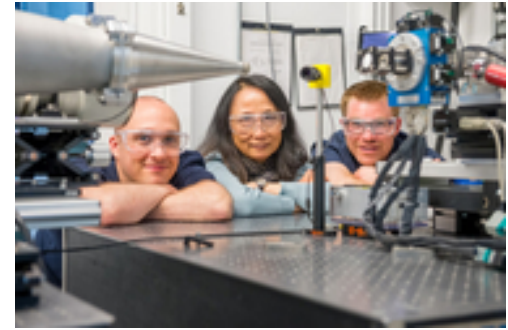
<https://www.wired.com/story/scientists-just-solved-a-major-piece-of-the-opioid-puzzle/>

The screenshot shows a Wired article page. At the top, the Wired logo is on the left, and the article title "Scientists Just Solved a Major Piece of the Opioid Puzzle" is on the right. Below the logo are navigation tabs for BUSINESS, CULTURE, DESIGN, GEAR, and SCIENCE. The article title is repeated in large, bold letters. To the left of the title are social media sharing options: SHARE (1200), TWEET, COMMENT, and EMAIL. Below the title is a 3D molecular model of the kappa opioid receptor, showing a blue helical structure with a pink and purple ligand bound to it. Below the model is a caption: "The kappa opioid receptor can mediate pain relief, but doesn't have addictive side effects. TAG CHE AND DANIEL WACKER/ROTH LAB/UNC SCHOOL OF MEDICINE". At the bottom, there is a paragraph of text starting with "WHEN IT COMES to tackling the opioid crisis, public health workers start with the drugs: fentanyl, morphine, heroin. But biochemists have a different focus: Not the opioids, but opioid receptors—the proteins the drugs latch onto within the body. These receptors embed themselves in the walls of cells throughout the brain and peripheral nervous system. There, they serve as cellular gatekeepers, unlocking not just the painkilling properties for which opioids are prized, but the severe, addictive, and often lethal side effects that, in 2016,

2017'S TOP STORIES FROM THE OFFICE OF SCIENCE: APS RESEARCH

▪ National Laboratory Articles (1 of 5)

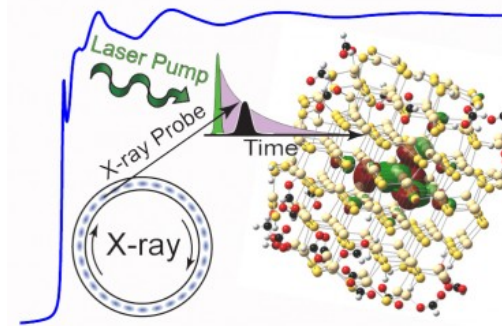
- **“Chemical “dance” of cobalt catalysis could pave way to solar fuels”** Argonne press release
 - “...using the Advanced Photon Source...researchers were able to directly measure cobalt oxidation states and use theory to calculate a quantity known as ‘exchange coupling,’ a quantum mechanical value that identifies the relationship between the spins of the electrons that are shuttled between the oxygen and cobalt atoms... found that these electrons spins are... antiferromagnetically coupled.”
 - “*In situ* characterization of cofacial Co(IV) centers in Co₄O₄ cubane: Modeling the high-valent active site in oxygen-evolving catalysts,” March 27 edition of the *Proceedings of the National Academy of Sciences*.



▪ University Articles (1 of 5)

- **“Newly discovered semiconductor dynamics may help improve energy efficiency”** University of Illinois at Chicago
 - “Using the Advanced Photon Source, they were able to capture X-ray images of what happens at the atomic level inside a semiconductor... [and] took very high energy X-ray photos of the semiconductors at millionths of a microsecond apart – which showed what was happening at the atomic level in real time as electrons flowed through the doped semiconductors.”

<https://science.energy.gov/news/featured-articles/2018/01-03-18/>



PACESETTERS

Thomas Toellner, Jiyong Zhao, Timothy Roberts (XSD), **Oliver Schmidt** (AES) for upgrading and reconfiguring beamline 3-ID

Ayman Said, Jung Ho Kim, Diego Casa, Michael Wieczorek, XianRong Huang, Elina Kasman (XSD) for fabricating quartz spherical crystal analyzers, attaining unprecedented, exceptional energy resolution for RIXS measurement on irdate compounds

Giampiero (JP) Sciutto (AES) for converting all the Linux machines at 8-ID (beamline and offices) to RHEL 7.3

Constance Vanni (PSC) for organizing and executing the highly successful 2017 APS/CNM Users Meeting

Bruce Glagola, Bruno Fieramosca, Shane Flood, Nena Moonier, Patricia Pederagnana, Wendy VanWingeren, Claybourne White, Dean Wyncott (PSC) for enabling efficient recovery and restart of APS user operations after operations were suspended

Kelly Jaje, Beverly Knott, Jessica Skwarek (PSC) for preparing hundreds of pages of information for the review books for the 2017 DOE BES Operations Review of the APS

PACESETTERS

William Yoder and **Roy Agner** (ASD) for upgrading the APS booster and storage ring rf cavities tuner motor driver systems

Susan Bettenhausen, Kurt Boerste, Joseph Gagliano, Eric McCarthy, John TerHAAR (ASD) for assembly and preparation of the novel helical superconducting undulator cryostat for the engineering cool-down study

Chris Roehrig, Junjing Deng, Zhonghou Cai, Curt A. Preissner (XSD) for successful installation and commissioning of the velociprobe

John Hammonds (XSD) and **Timothy Madden** (ASD) for developing and implementing a real-time acquisition with data compression for the state-of-the-art LAMBDA detector operating at a frame rate of 2000 frames/sec

Dana Capatina (XSD) for leading the planning, design, and installation phases of the S4 cant upgrade project

Richard Spence (XSD) for initiating and implementing a significant reduction and consolidation of stored equipment in an expensive space

Diane Wilkinson (PSC/APSU) for a very successful OPA review of the APS Upgrade

Jeff McGhee (HSE/APSU) and **Jeremy Nudell** (AES) for planning and execution of the test FODO section lift

25+ YEARS SERVICE AWARDS

Gregory Banks

Kurt Boerste

Edmund Chang

Steve Christensen

Clarence Clark (**50 years**)

Roger Dejus

Nicholas DiMonte

Bruce Epperson

Bruce Glagola

Guy Harris

John Hoyt

William Jansma

David Lichty

Mark Martens

Dennis Mills

Linda Shoudis

Kenneth Sidorowicz

Emil Trakhtenberg

Kenneth Volin

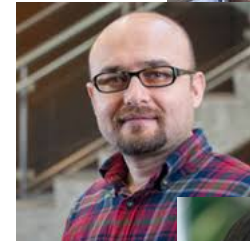
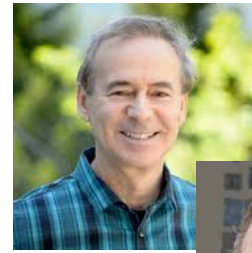
Robert Wright

Randall Zabel

Raymond Ziegler

AWARDS

- **Alexander (Sasha) Zholents** (ASD) named an Argonne Distinguished Fellow
- **Brian Toby** (XSD) elected a Fellow of the American Crystallographic Association
- **Ibrahim Kesgin** (ASD) received the first Jan Evetts Award for best paper by a young researcher published in the journal *Superconductor Science and Technology*
- **Byeongdu Lee** (XSD/CMS) received the APSUO Award for Excellence in Beamline Science, which recognizes beamline scientists who have made significant scientific contributions in their area of research or instrumentation development and have promoted the user community in this area
- **Amy Rosenzweig** (Northwestern University) APS user and Professor of Life Sciences and Molecular Biosciences and Chemistry, elected to the prestigious National Academy of Sciences for distinguished achievements in original research
- **James Rondinelli** (Northwestern University) APS user and Assistant Professor in Materials Science and Engineering, received 2017 MRS Outstanding Young Investigator Award



- Questions?