

Monthly User Operations Meeting

Stephen Streiffer
August 28, 2014

Agenda

- APS Update and Status Report
 - Safety
 - Science Highlights
 - Technical Highlights
 - FY15 Budget info from the BESAC Meeting
 - Status of APS Strategic Plan
 - Change of Leadership at AES
 - Upcoming Conferences and Meetings
 - Awards

- APS Upgrade Update – Stuart Henderson



Safety: Don't be this person.....



Yes, someone was sleeping in this!

This Is Not Allowed at APS
(stringing up a hammock that is)

Safety:

Reminder on Beamline Work Planning & Control

- ESAF remains the Work Planning and Controls application for all APS experiments
- **All beamlines, including non-APS ones**, must have non-experimental activities conducted by beamline staff covered by a Work Control Document (WCD) by **September 30**
- WCDs must be produced using the Argonne WPC web application – **ESAFs cannot be used to cover non-experimental work**
- APS Procedure 3.1.124 (APS_1432773) describes requirements and responsibilities for beamline non-experimental activity work planning & control (WPC)
 - Non-experimental activity includes maintenance, equipment change out or modification, alignment & mechanical adjustments, and electronic interfacing on beamline equipment
- These activities are covered by existing WCD #19202.1 and beamlines having activities covered by this document must reference it, preferably in their safety plan
- Beamline activities not covered by WCD #19202.1 must be covered by one or more WCDs by September 30, 2014
- Three types of work activity can be addressed by a WCD:
 - Skill of the Worker (routine simple tasks)
 - Work conducted under a procedure (procedure must identify hazards and hazard controls)
 - Task-specific work (one of a kind or infrequent tasks)
- **Paul Rossi or Elroy Chang can provide assistance on generating WCDs**





Science Highlight -

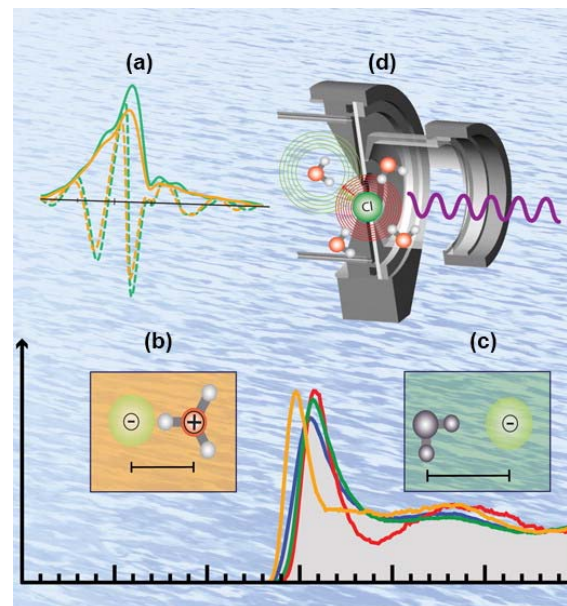
- Stephen pick one or two of the next slides for a Science Highlight



Science Highlights:

Acid Ions are More Than Spectators

- Countless chemical reactions (many industrially, biologically, and atmospherically important) rely on presence of excess protons in the reaction solution formed by dissociation of a strong acid into dissolved hydrogen ions and counter ion.
- Chemists assumed that this dissociation has two steps.
- Research at XSD 20-BM coupled with state-of-the-art density functional theory simulations provides a molecular picture of deviations from ideal acid dissociation.
- Revealed that strong acids form counter-ion pairs in solution across all concentration, result not seen in gas-phase studies.
- Suggests that it is not simply the release of protons — hydrogen ions — that is important for the properties of acids.
- Study provides a template to investigate and understand the details of other acids and their chemistries under a variety of different environments including interfaces.



The experimental prediction and theoretical confirmation of persistent ion pairing between hydronium and chloride provides a unified description of the molecular structure of concentrated hydrogen-chloride solutions. The partial decompositions into Cl–O (H_3O^+) and Cl–O (H_2O) are shown in orange and green, respectively, with the structural portions depicted as insets in (b) and (c). Water hydrogens and oxygens are rendered as small and large gray-scaled spheres, respectively. Charge is indicated with "+" or "-", and the chloride is rendered as a green sphere. (d) is the experiment set-up.

This research used resources of the Advanced Photon Source, a U.S. Department of Energy Office of Science User Facility operated for the DOE Office of Science by Argonne National Laboratory under Contract No. DE-AC02-06CH11357.

M.D. Baer¹, J.L. Fulton¹, M. Balasubramanian², G.K. Schenter¹, and C.J. Mundy^{1*}, "Persistent Ion Pairing in Aqueous Hydrochloric Acid," [J. Phys. Chem. B 118, 7211 \(2014\)](#). DOI:10.1021/jp501091h

Author affiliations: ¹Pacific Northwest National Laboratory, ²Argonne National Laboratory

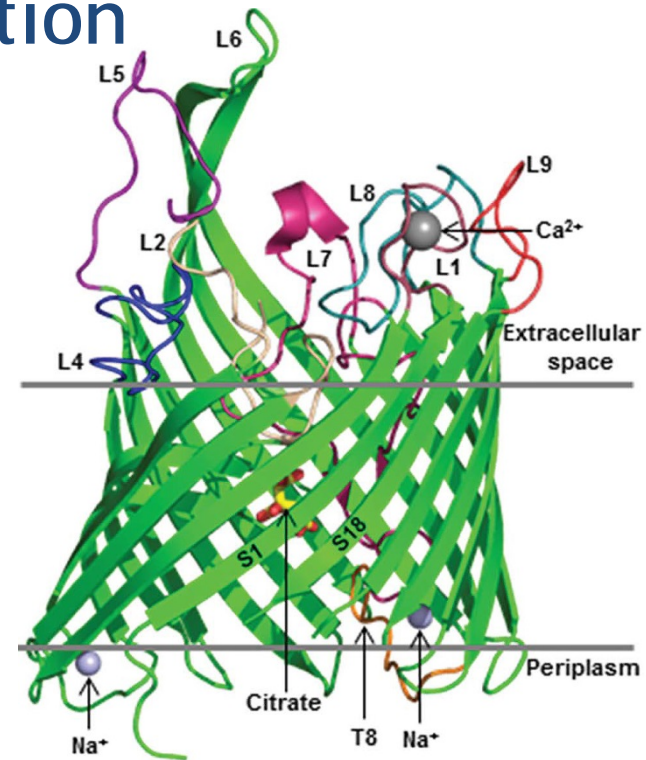
Correspondence: * chris.mundy@pnnl.gov

The Advanced Photon Source is an Office of Science User Facility operated for the U.S. Department of Energy Office of Science by Argonne National Laboratory



Science Highlights: Blueprints of a Bacterial Infection

- *Pseudomonas aeruginosa* is a resilient, adaptable species of bacteria that causes disease by infecting damaged tissue and overpowering people whose immune response is compromised in some way.
- It is particularly associated with cystic fibrosis, thrives on moist surfaces, and is often implicated in cross-infection cases in hospitals.
- Research at GM/CA-XSD 23-ID-B provides a blueprint of the cellular machinery used by *P. aeruginosa*.
- The hope is that these structural plans can be used to design specific drugs that will impede the bacterial functions and prevent a potentially deadly component from being shipped out.



Crystal structure (ribbon model) of the alginate transporter from the outer membrane of a *Pseudomonas aeruginosa* bacteria viewed from the membrane plane, determined by x-ray crystallography. From J. Tan et al., *Acta Cryst. D70*, 2054 (2014).

■ J. Tan¹, S.L. Rouse², D. Li¹, V.E. Pye¹, L. Vogele¹, A.R. Brinth¹, T. El Arnaout¹, J.C. Whitney^{3,4}, P.L. Howell^{3,4}, M.S.P. Sansom^{2>}, and M. Caffrey^{1*}, "A conformational landscape for alginate secretion across the outer membrane of *Pseudomonas aeruginosa*," [Acta Cryst. D70, 2054 \(2014\)](#). DOI: 10.1107/S1399004714001850

■ Author affiliations: ¹Trinity College Dublin, ²University of Oxford, ³The Hospital for Sick Children, ⁴University of Toronto

■ Correspondence: *martin.caffrey@tcd.ie

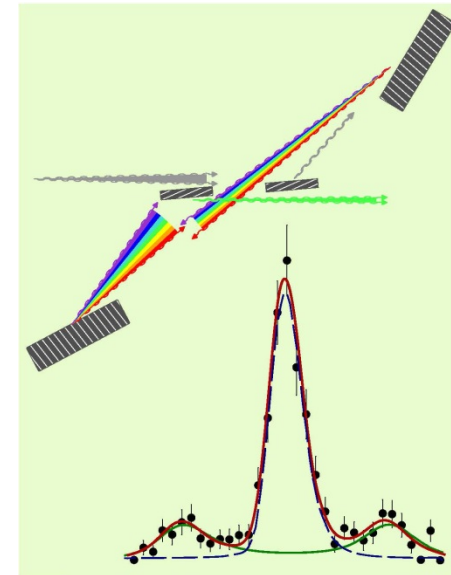
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Science Highlights:

A Narrower Spectrum for a Wider View of Matter

- Gaps in the resolutions of inelastic x-ray scattering — distances of 1 nm to a few hundredths of a nm and time scales from a few psec to ~ 100 psec — are the location of a key physical phenomenon: the liquid-glass transition, one of the great mysteries of condensed matter physics.
- Understanding it could provide new theoretical insights and help pharmaceutical researchers make drugs that are more easily absorbed in the body.
- Previously inaccessible time and length scales were attained at XSD 30-ID-B,C using a new ultra-high-resolution IEX spectrometer containing crystals with asymmetric, atomic-scale gratings.
- The technique was applied to liquid glycerol, resulting in more precise measurements than had ever been made on such a sample before.
- This new paradigm could be developed into an even better spectrometer opening it to a wide range of measurement applications.



Ultra-high-resolution dispersive optics of the new IXS spectrometer (top) and IXS spectrum of liquid glycerol measured with this spectrometer (bottom). In dispersive optics of IXS spectrometer an incoming x-ray beam (double gray line) strikes a collimator crystal, which sends a parallel beam (single gray line) toward a dispersion element (top right). That spreads the beam into a rainbow and sends it to a second dispersion element (bottom left), which spreads it further and sends it to a wavelength selector, which passes only photons traveling within a narrow range of angles and wavelengths (green line). When measuring the IXS spectrum of a sample of liquid glycerol, the system records exceptionally narrow spectral lines (solid circles).

Y. Shvyd'ko^{1*}, S. Stoupin¹, D. Shu¹, S.P. Collins², K. Mundboth², J. Sutter², and M. Tolkiehn³, "High-contrast sub-millivolt inelastic X-ray scattering for nano- and mesoscale science," ([published online June 23, 2014](#)). DOI:10.1038/ncomms5219
Author affiliations: ¹Argonne National Laboratory, ²Diamond Light Source Ltd., ³DESY Correspondence: * shvydtko@aps.anl.gov

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Technical Highlights: DCS Test-fires the Two-Stage Gun at APS

- First shot at APS with two-stage gun occurred on July 31
 - Major project milestone
- Worked with user community to let them know when the gun was fired to look for indications of vibrations from the shot.
- Vibrations not detected with local accelerometers – GOOD NEWS!



Technical Highlights:

Construction Status of 27-ID RIXS (Aug. 2014)

- All conventional facilities (shielding enclosures, control room, utilities ...) are finished
- Front-End and all First Optics Enclosure (FOE) components are installed (white-beam slit, monochromator, white-beam stop, collimators, photon shutter, ...)
- **First monochromatic beam in B-station end of July 2014**
- Characterization and optimization underway
- Installation of RIXS instrumentation expected for September 2014
- **Commissioning and limited user operations in 2014-3 and 2015-1**

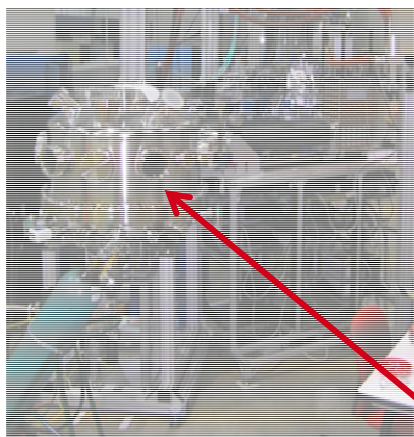


FOE: upstream and downstream views

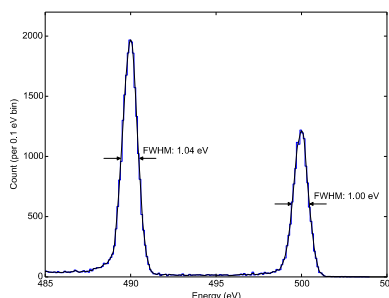
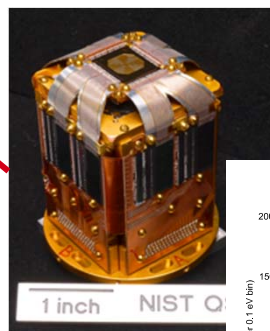
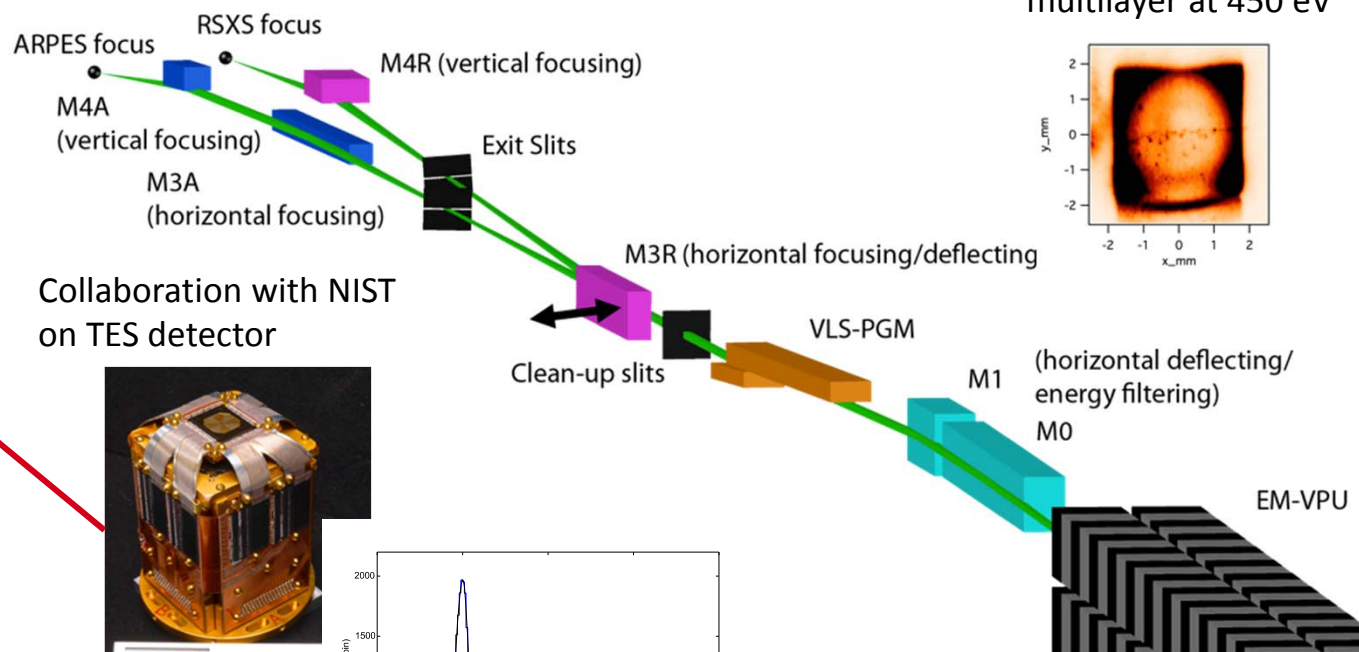


Technical Highlights: Intermediate Energy X-ray Beamline Commissioning

RSXS endstation



ARPES endstation



Aug 25: Specular peak from YAG crystal
on a single pixel at two photon energies

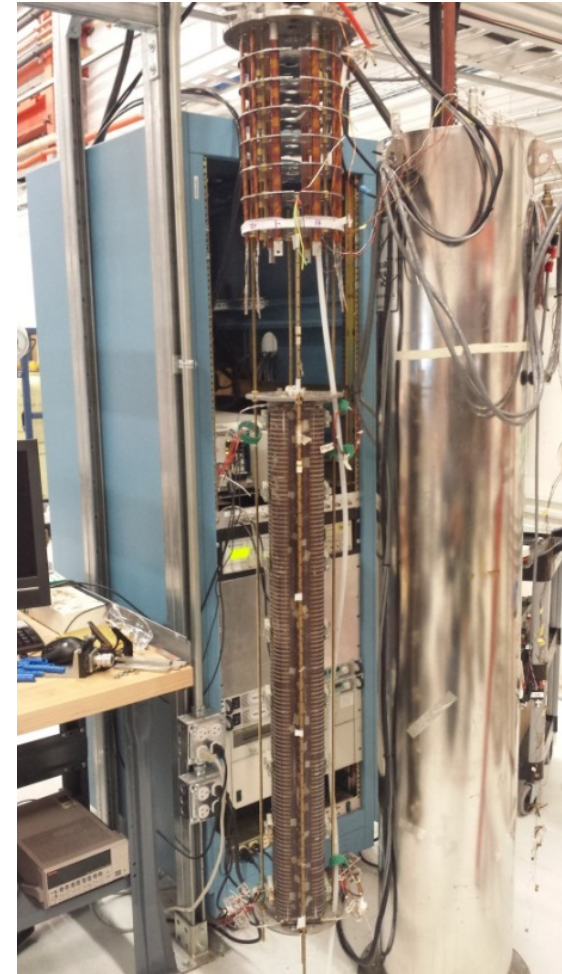
Timeline

- Currently commissioning beamline optics
- First light RSXS station in August
- Fall/Winter end-station comm. & first experiments
- **Summer 2015 begin user program**



Technical Highlights: Update on SCU1

- Two magnet cores have been fully fabricated, one more core is being fabricated.
- Cold test of a two-core assembly is in progress:
 - Magnet assembly (shown) is cooled down in a vertical LHe cryostat;
 - Magnet is trained up to 500 A (expected working current is around 450 A);
 - Preliminary measurements with a Hall probe indicate a good field profile (shown);
 - Measured peak field is 0.9 T at 400 A.
- After the magnet is cold tested, it will be assembled into a cold mass and installed into the SCU1 cryostat.
- Preparation of Sector 1 for SCU1 installation is in progress.



Two-core magnet assembly and a vertical LHe cryostat



FY15 Budget:

BESAC Meeting July 29 - some of Pat Dehmer's Slides

SC Funding Status

(budget authority in thousands of dollars)

	FY 2013	FY 2014	FY 2015					
	Approp.	Approp.	Request	House	Senate	Senate vs. House		
ASCR	417,778	478,093	541,000	541,000	557,000	+16,000	+3.0%	
BES	1,601,166	1,711,929	1,806,500	1,702,000	1,806,500	+104,500	+6.1%	
BER	578,294	609,696	628,000	540,000	627,533	+87,533	+16.2%	
FES	380,137	504,677	416,000	540,000	341,000	-199,000	-36.9%	
HEP	748,314	796,521	744,000	775,000	774,482	-518	-0.1%	
NP	519,859	569,138	593,573	600,000	601,573	+1,573	+0.3%	
WDTS	17,486	26,500	19,500	19,500	29,500	+10,000	+51.3%	
SLI	105,673	97,818	79,189	79,500	66,689	-12,811	-16.1%	
S&S	77,506	87,000	94,000	94,000	94,000	—	—	
PD	174,862	185,000	189,393	180,000	187,723	+7,723	+4.3%	
Subtotal, SC	4,621,075	5,066,372	5,111,155	5,071,000	5,086,000	+15,000	+0.3%	
Use of PYB	—	—	—	-5,257	-7,022	-1,765	-33.6%	
Total, SC	4,621,075	5,066,372	5,111,155	5,065,743	5,078,978	+13,235	+0.3%	



A more efficient and cost effective conditioning method employed for 352-MHz RF components at APS

RF Conditioning purpose is to eliminate particulates, induce controlled gas desorption and helps remove field emission sites. New rf cavity components (couplers, tuners, dampers) require conditioning at full power before use.

Previous Conditioning Method – Continuous Wave

- Energy consumption : 227368 kW-hr
- Energy consumption cost: \$14,779
- Average time required for conditioning is 475 hours

Improved Conditioning Method – Pulsed then Continuous Wave

- Reduces energy consumption by 205263 kW-hr
- Reduces energy consumption cost to \$1400
 - Significant cost saving (\$13,379) per rf conditioning cycle
- Prolongs klystron lifetime.
- Average time required for conditioning is 75 hours(saves approximately 400 hours of rf conditioning time per component).
- Eliminates backlog of new tuners and couplers waiting for conditioning.
- Provides a faster way to evaluate failed rf components using RF test stand.

APS Strategic Plan: Status

- **Feedback collected**

- May: Initial draft of plan sent to APS staff for review
- June 21: Draft plan sent to APS Science Advisory Committee for initial review
- July 9: Discussion of draft plan with APS Users Organization and Partner User Council

- **Where we are at:**

- Comments from all meetings being integrated into plan
- Underway: XSD Beamline-by-beamline SWOT analysis
- Underway: Design of new integrated Resource Allocation Process and Mission Readiness plans

Next Steps:

- Early September: Revised draft to ANL management
- Mid-September: Draft to UChicago Argonne LLC Board of Governors
- End of September: Draft to DOE
- October: Final plan posted.



Change in Leadership at APS Engineering Support (AES)

- Starting Sept. 1, William Ruzicka, director of the AES, will move to a new role handling special projects with the APS ALD office.
- Bill's first assignment will be to Bldg 211 (which houses a 58 MeV linear accelerator and Van de Graaff accelerator).
- John Mclean, AES associate division director, has agreed to serve as interim director while a hiring search is conducted.



Conferences and Workshops

- *International Workshop on Phase Retrieval and Coherent Scattering*, September 2-5, 2014 at Northwestern University
 - Will also hold one-day satellite workshop on APS-U on Sept. 7, 2014, Chairs David Vine, Ross Harder
- *Synchrotron Environmental Science VI* September 11-12, 2014 at ANL.
- *HPCAT workshop on high-pressure time-resolved synchrotron techniques* September 25-27, 2014 at ANL.
- Next *DLSR Workshop* being planned for November 2014, to be held at Argonne.
- NSLS is hosting the *12th International SRI Conference* in NYC on July 6-10, 2015.





Pacesetter Award to Shifu Xu

This award is presented in recognition of Extraordinary Effort. Shifu has taken over the significant task of upgrading the Real Time Feedback Controllers from Frank Lenkszus. These controllers form a critical part of the accelerator and are extremely complex in both their function and in their internals. He has, without a single incident of beam loss, upgraded all of the twenty RTFB Controllers and their data concentrator from a ten year old version of the controls software to a recent version. This enables long-term support, improves reliability and MTTR, and prepares the way for the MBA Upgrade .





Pacesetter Award to Troy Lutes

This award is presented to Troy in recognition of Extraordinary Effort and Innovation in having worked the extended hours required to learn, install, and operate the SolarWinds support system while maintaining commitments to the beamlines XSD-DET, Sectors 6, 7, 8, 22, 35 (Dynamic Compression) and Linux support. The task was completed on time, on budget and functions as designed.






Pacesetter to Terry Smith (ASD-RF) and Nicholas DiMonte (AES-CTL)

This award is presented to Terry and Nick in recognition of their Extraordinary Effort in providing outstanding technical support for successful testing of QMiR and exceeding a difficult deadline.





Pacesetter Awards to Sheila Trznadel (XSD), Colleen Trattner (XSD), and Vanessa Mendez (CLS)

This award is presented in recognition of Extraordinary Effort by Sheila, Colleen and Vanessa, as they worked together to assemble, price-out and apply for a \$2.3M detector from the NIH. The proposal submission required a significant amount of effort and creativity to prepare the package and submit it within the deadline.





Twenty-Year Service Award

Congratulations to Judy A. Walden for
twenty years of dedicated service to
Argonne National Laboratory!!

