Welcome

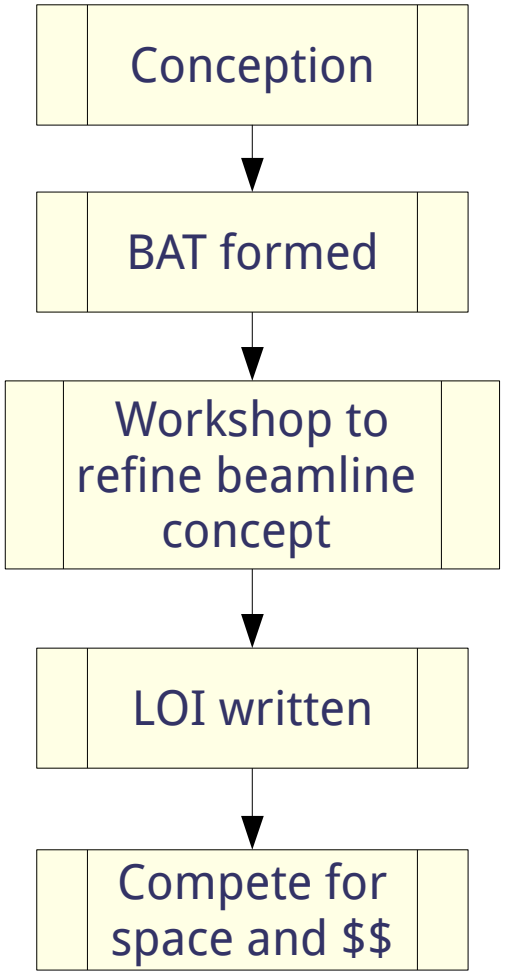
- Bruce Ravel: Purpose of this workshop
- Paul Northrup: Technical description of beamline
- John Hill: NSLS-II overview, NSLS-II access modes
- Scientific drivers for XAS-using communities
  - Vince Harris: materials science and magnetism
  - Ingrid Pickering: life science
  - Don Sparks: environmental science
  - Sven Schroeder: catalysis, chemical, and energy science
  - Wendy Mao: High pressure and geological science
- Lunch ~12:00 – 1:00 (after Don's talk)
- Workshop photo at 2:15 (after Wendy's talk)
- Open discussion of scientific needs
- Establishment of Beamline Advisory Team

Purpose of this workshop

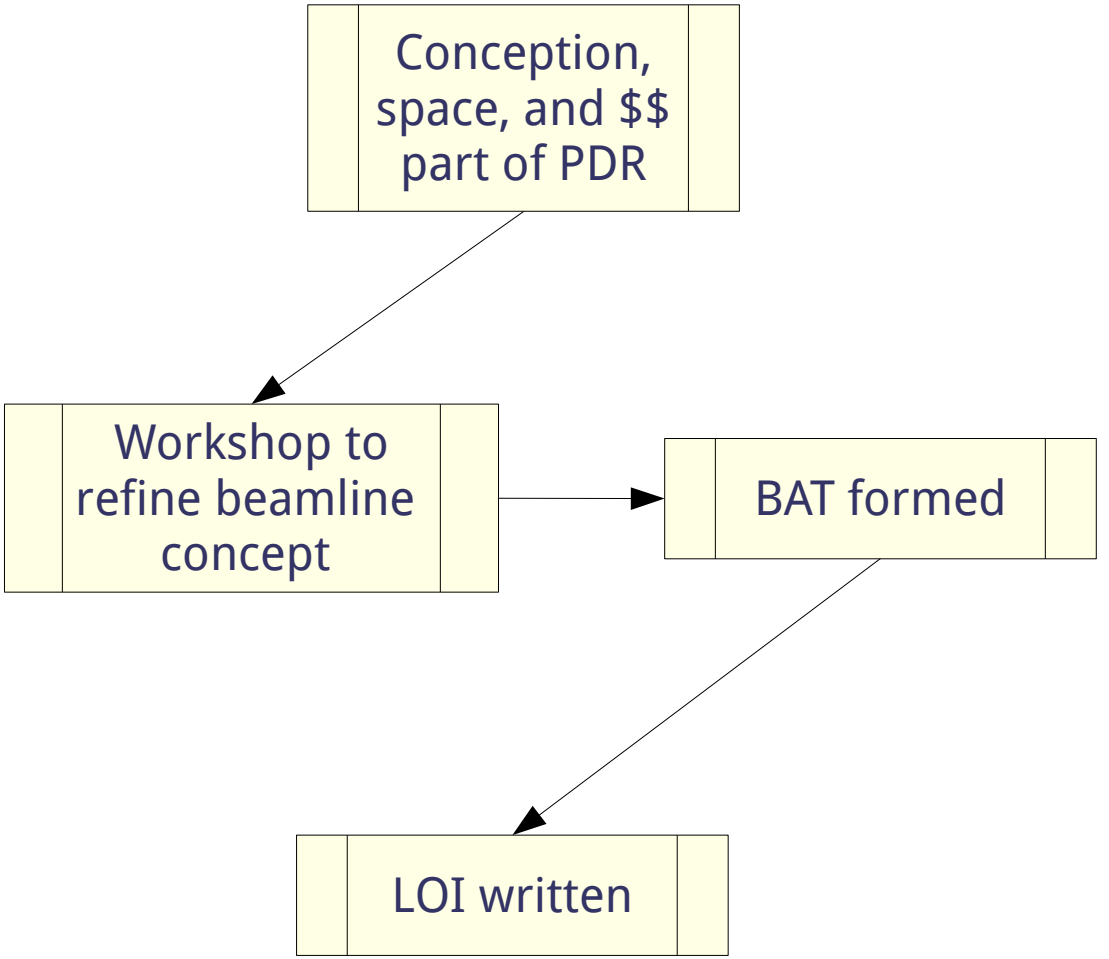
- Present the design of the Damping Wiggler XAS beamline to the community
- Discuss the scientific and instrumentation needs of the XAS community
- Establish the Beamline Advisory Team (BAT)
- Primary deliverable: The Letter of Intent (LOI)

How beamlines are born

The NSLS-II Beamline Creation Process



The NSLS-II Project Beamline Process



Beamline Advisory Team

- Small team which submits a Letter of Intent (reviewed by the EFAC)
- Propose scientific mission and technical requirements for beamline
- Facility hires beamline staff, designs & builds beamlines
- BAT meets every 6 months, working closely with the facility to advise them during design, construction, commissioning, and early operations
- Represent a particular User community
- Report to XFD Director

I have asked well-known members of the NSLS community to be discipline-specific advocates on the BAT.

- Chair: Bruce Ravel
- Discipline representatives
  - Catalysis: Anatoly Frenkel
  - Materials: Joe Woicik
  - Environmental: Satish Myneni
  - Biology: Mark Chance
- Instrumentation: Jeremy Kropf

Letter of Intent

- The scientific case for the beamline.
  - Key scientific drivers for this beamline. How does NSLS-II impact this field. What unique capabilities will it provide and which scientific questions will these address?
- The technical requirements and specifications of the beamline.
  - What requirements flow from the scientific justification? (q-ranges, energy resolution, sample environments, need to take full undulator beam...).
- How does it meet the needs of the user community?
  - Documentation of User demand for the beamline. User workshops held. White papers written. Appendix: containing a list of supporters/potential users
- What source does it need and why?
  - Discussion of performance and high level parameters. Choice of straight section.
- Summary of Team members and their expertise.

Drafts will be available at `http://xafs.org/NSLSII/DampingWigglerXasStation`

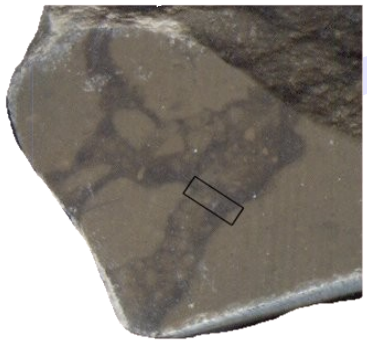
Beamline development process

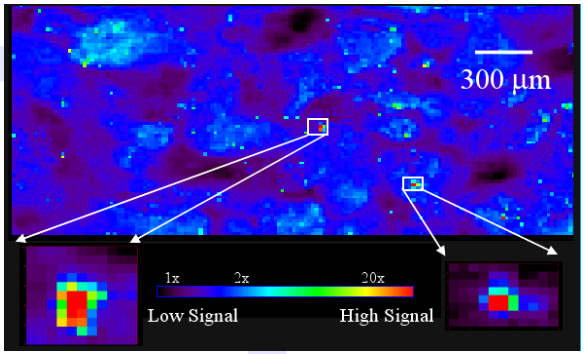
- The BAT will interact closely with the development team
- The BAT will communicate openly, transparently, and regularly with the XAS community
- Community involvement at all stages – planning, development, construction, and commissioning – of the DWXAS beamline is encouraged

See the handouts for internet information resources.

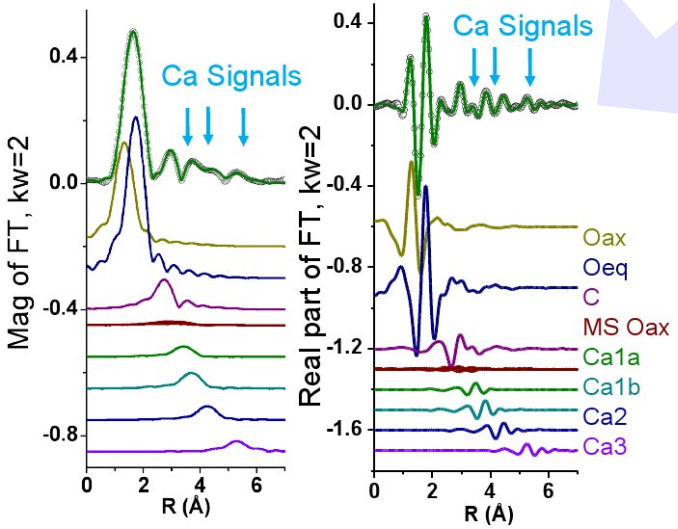
New science 1: low concentration

This beamline will enable new science via the extraordinary flux of the damping wiggler source.

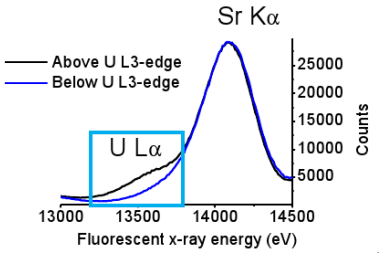




µEXAFS on an ancient, organic rich paleosol from the Permian Basin of West Texas was used to demonstrate a plausible, long-term uranium sequestration strategy of incorporation into a calcite matrix.



Small U signal
Large Sr signal



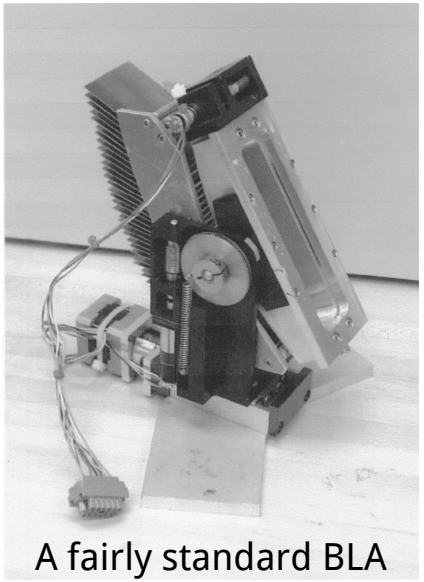
- APS beamline 10ID
- 10 µm spot
- Flux: ~10^{11} photons per second
- 2½ days of continuous measurement
- About 2x10^{16} total photons

APS 10ID	10^{11} ph/sec	2½ days
APS 20BM	10^{8} ph/sec	>6 years
X26a	3x10^{8} ph/sec	24 months
DWXAS	**10^{12} ph/sec**	**6 hours!**

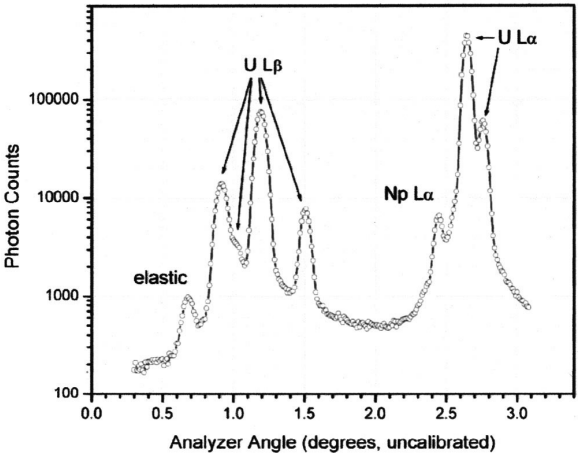
S.D. Kelly, E.T. Rasbury, S. Chattopardhyay, A.J. Kropf, K.M. Kemnner, *Evidence of a stable uranyl site in ancient organic-rich calcite*. Environ. Sci. Technol. (2006), **40**(7), 2262-2268.

This is not *just* a brighter beamline. This flux will enable consideration of new experiments at relevant concentrations that cannot be done at NSLS.

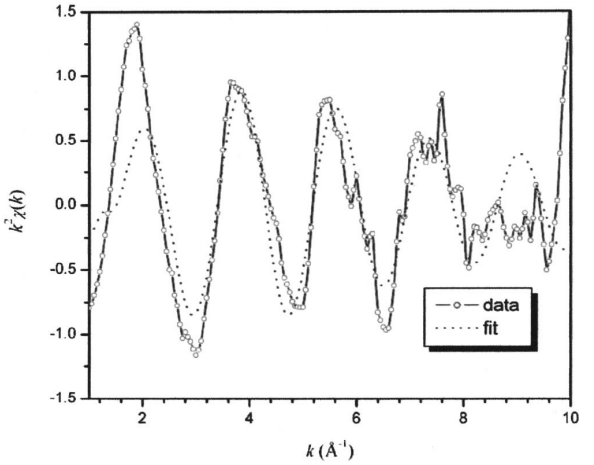
New science 2: low efficiency detectors



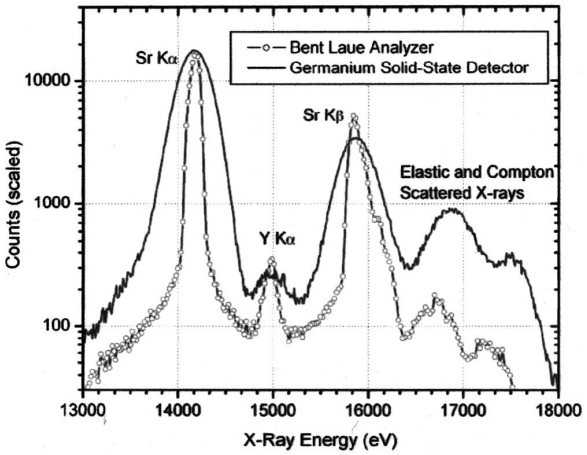
A fairly standard BLA



BLA spectrum for 1 part Np in 160 parts U_3O_8.



χ(k) data measured from Np Lα peak



Y_2O_3 /SrO

This resolution is impressive, but the efficiency is only about 25% and the subtended angle is small.

"The signal to background is 3.5:1, even though the Np peak is still clearly sitting on the tail of the uranium fluorescence peak as in [the figure]. This ratio means that the uranium fluorescence has been reduced by about 550 compared to the unfiltered beam. As a practical consequence, since reasonably good XAFS spectra can generally be obtained in the fluorescence mode for a signal-to-background ratio of 1:2, given enough time, we could theoretically measure XAFS with no change to this configuration for a 1:1100 Np to U ratio."

The superior flux of the damping wiggler source will enable these high-resolution measurements of a small impurity in a dense matrix.

A. J. Kropf, R. J. Finch, J. A. Fortner, S. Aase, C. Karanfil, C. U. Segre, J. Terry, G. Bunker, and L. D. Chapman, *Bent silicon crystal in the Laue geometry to resolve x-ray fluorescence for x-ray absorption spectroscopy*, Rev. Sci. Instrum. (2003), **74**, 4696-4702

Today's big questions

- What novel experiments would *you* perform with this high-flux source?
- What instrumentation and infrastructure would *you* like to see at this beamline?
- What other XAS capabilities and beamlines would *you* like to see at NSLS-II?

Stay involved!

http://xafs.org/NSLSII/DampingWigglerXasStation