User outreach

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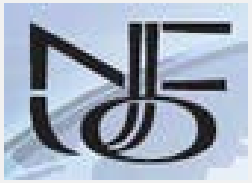
April 22, 2015



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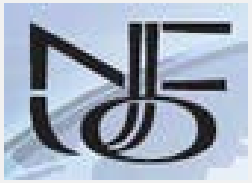

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“There is only one thing in the world worse than being talked about, and that is not being talked about.”

– Oscar Wilde

1854-1900

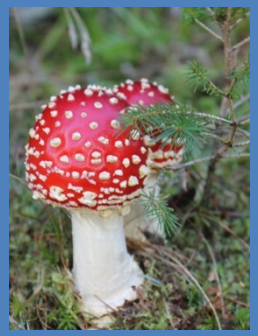
DOE Joint Genome Institute

- Located in Walnut Creek, CA facility opened in 1999
- 250 employees
- $69M annual expenses
- 1,263 Users in FY2014
- Dedicated pipeline for BRCs

Mission: to serve as a genomic user facility in support of the DOE's interests in:

bioenergy, carbon cycling, & biogeochemistry

2008-2015: JGI as the most productive WW sequencing center dedicated to plants, fungi and microbes.



Getting Social: Doing OK
Third-Party Validation/Amplification

genomeweb

Business & Policy | Technology | Research | Clinical | Disease Areas | Applied Markets | Resourc

Home » Tools & Technology » Sequencing Technology » JGI Focuses on New Technology; Moves Beyond Sequencing to Functional An

JGI Focuses on New Technology; Moves Beyond Sequencing to Functional Annotation, Synthetic Biology

Mar 31, 2015 | Monica Heger

Premium

NEW YORK (GenomeWeb) – The Department of Energy's Joint Genome Institute continues to test new next-generation sequencing technologies, develop techniques and methods to improve on existing technologies, and aims to move beyond sequencing into functional genomics and synthetic biology, JGI officials said at last week's annual user meeting in Walnut Creek, Calif.

Although next-gen sequencing continues to be a focus of the JGI, last year the institute said it was moving beyond being a sequencing facility and working on technologies at the front and back ends as well as on basic science itself.

At this year's meeting, JGI officials presented on their advances in generating reference genomes, technology that the center is developing for sample prep and single-cell sequencing, functional genomics studies, and a new program in synthetic biology.

"JGI has and always will be a powerhouse of reference genome sequencing," Chia-Lin Wei, JGI's group lead of sequencing technologies, said in a presentation. And indeed, it expects to generate 120 Tb of sequence data this year, up from around 100 Tb the previous year.

Much of that data comes from *de novo* assemblies. According to Alicia Clum, genome assembly developer, JGI expects to *de novo* assemble around 1,000 microbial genomes, 110 fungal genomes, 20 plant genomes, and 580 metagenomes this year.

Nonetheless, said Lin, "we're pushing from genome sequencing to function" by developing technologies to characterize and understand the transcriptome, transcription regulation, epigenetic modification, and metabolomics.

TheScientist
EXPLORING LIFE, INSPIRING INNOVATION

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Hiding in Plain Sight

Researchers using metagenomics and single-cell sequencing identify a potential new bacterial phylum.

By Kim Smuga-Otto | March 31, 2015

Kryptonite ©DC Comics
FLICKR, MARK ANDERSON

Studies on 16s ribosomal RNA (rRNA) sequences have opened scientists' eyes to the complexity of microbial communities, but some bacteria evade detection. At the US Department of Energy (DOE) Joint Genome Institute User Meeting held in Walnut Creek, California, last week, researchers announced the genomic identification of a potential new bacterial phylum, Candidatus Kryptonia, based on their study of samples isolated from four hot springs located in North America and Asia. Altogether, the DOE team sequenced 22 Kryptonia genomes.

"It's always difficult to claim absolutely a new lineage until you've done some biochemical tests," said microbial ecologist Jack Gilbert of Argonne National Laboratory and the University of Chicago, who was not involved with the study, "but, genomics-wise, this thing appears to fit outside of our current understanding."

Genomic analyses place Kryptonia in the Bacteroidetes superphylum, whose members thrive in the gut and in marine environments. If confirmed, Kryptonia would be the first extreme thermophile found in this group. Kryptonia appears to have acquired this characteristic through horizontal gene transfer from Archaea.

"This work is very exciting in that it seems to contribute to several populations present in high pH neutral thermal systems that aren't accounted for yet," geomicrobiologist Bill Inskeep of Montana State University's Thermal Biology Institute told *The Scientist*. Inskeep was not involved in the work.

Kryptonia likely eluded 16s rRNA detection because of a deletion on the gene where the universal primers would bind. DOE scientists eventually identified and confirmed Kryptonia using two powerful techniques—metagenomic sequencing and single-cell sequencing. Nikos Kyrpides, who led the work,

Moving from Print to Electrons: *The Primer*

- Quarterly print and electronic newsletter
- Primary Audiences: Users/Prospective Users, Program Managers
- Average print distribution: 1,000
- Average electronic download: 2,000
- Promoted through ~14,000 name email distribution list//JGI website/social media
- Half-dozen stories excerpted in email and linked to news releases/publications

THE PRIMER

JGI fall 2014 volume 11 issue 4

Delving Deeper into Earth's Data Mine:
2015 Community Science Program Portfolio Selected

in this issue

Near the town of Rifle, Colorado, lies the primary field site for Phase 1 of the Subsurface Systems Scientific Focus Area 2.0. Longtime DOE JGI collaborator Jill Banfield of UC Berkeley is profiling the diversity of microbial communities found in the subsurface from the Rifle aquifer adjacent to the Colorado River. (Roy Kaltschmidt, LBNL)

The 32 projects selected for the 2015 Community Science Program (CSP) of the U.S. Department of Energy Joint Genome Institute (DOE JGI), a DOE Office of Science user facility, highlight diverse environments where DOE mission-relevant science can be extracted. These habitats range from sampling Antarctic lakes to Caribbean waters, and from plant root micro-ecosystems, to the subsurface underneath the water table in forested watersheds.

"These projects catalyze JGI's strategic shift in emphasis from solving an organism's genome sequence to facilitating an understanding of what this information enables organisms to do," said Jim Bristow, DOE JGI Science Deputy who oversees the CSP. "To accomplish this, the projects selected combine DNA sequencing with large-scale experimental and computational capabilities, and in some cases include JGI's new capability to write DNA in addition to reading it. These projects will expand research communities, and help to meet the DOE JGI imperative to translate sequence to function and ultimately into solutions for major energy and environmental problems."

Among the CSP 2015 projects selected is one from Regina Lamendella of Juniata College, who will investigate how microbial communities in Marcellus shale, the country's largest shale gas field, respond to hydraulic fracturing and natural gas extraction. For example, as fracking uses chemicals, researchers are interested in how the microbial communities can break down environmental contaminants, and how they respond to the release of methane during oil extraction operations.

Some 1,500 miles south from those gas extraction sites, Monica Medina-Munoz of Penn State University will study the effect of thermal stress on the Caribbean coral *Orbicella faveolata* and continued on page 4

DOE JGI, EMSL Select 2015 Collaborative Science Projects

The DOE JGI and the Environmental Molecular Sciences Laboratory (EMSL) accepted 12 projects submitted during the 2014 call for Collaborative Science Initiative proposals. The selected researchers will have access to the capabilities of both user facilities. They will also be able to generate datasets unique to these two facilities—beyond what could be generated by either facility by itself.

"These approved projects represent an excellent cross-section of research in biogeochemistry, carbon cycling and biofuel/bioproduct production," said continued on page 6

The interaction between aspens, ectomycorrhizal fungi and plant growth promoting bacteria is the focus of a selected proposal from Jonathan Cumming of West Virginia University. (Image by Roy Kaltschmidt, LBNL)

Challenges: Partnering with Societies/Going Beyond Repeat Customers

JGI JOINT GENOME INSTITUTE
A DOE OFFICE OF SCIENCE USER FACILITY

Call for Large-scale Genomic Proposals

The DOE Joint Genome Institute (DOE JGI) Community Science Program (CSP) is now accepting Letters of Intent (LOI) for large-scale sequence-based genomic science projects addressing DOE missions in sustainable biofuel production, global carbon cycling, and biogeochemistry.

Focus areas include:

- Functional Genomics and Microbiomes of DOE JGI Flagship Plants (http://bit.ly/JGI-Plants). Projects should be aligned with one of the following categories:
  a. Gene Atlas and ENCODE-like projects
  b. Large-scale resequencing projects
  c. Comparative grade de novo genomes
  d. Plant microbiomes
  e. Algal functional genomics
- Function-driven Microbial Genomics

JGI-EMSL Collaborative Science Initiative

Access the combined resources of DOE JGI and the Environmental Molecular Science Laboratory (EMSL).

Focus areas include:

A. Biofuels and bioproducts
B. Plant-microbe interactions that impact climate

LOI due: April 6, 2015

For more information: http://bit.ly/FY16_JGI-EMSL

DNA Synthesis Program Call for Proposals

This program enables our users to translate genomic information into biological function by providing access to:

- Large-scale DNA synthesis and

3rd Party Email Promo Campaigns

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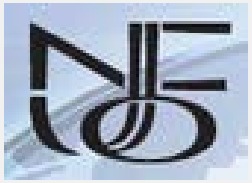

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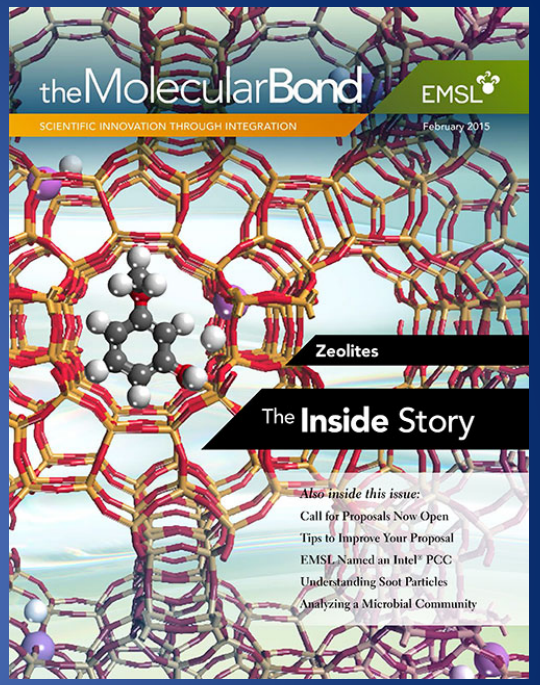
Facility introduction – EMSL

- John Nicksich, EMSL comm. specialist
  - Main duties: website content, user newsletter, social media
- EMSL at PNNL in Richland, Wash.
  - Offers integrated experimental and computational resources in the biological, chemical and environmental sciences
  - Sponsored by the DOE BER
- Mission: To lead molecular-level discoveries
- Users: Global user community with PIs funded by DOE science and applied programs, NSF, NIH, industry, etc.

What we do well

- Email communications to ~8K-member user list
  - Announcements – calls, fellowships, etc.
  - Bimonthly newsletter (soft & hard copies)
- Recently redesigned website in Drupal
  - http://www.emsl.pnnl.gov/emslweb/
  - Regular new content
  - Ongoing enhancements
- Social media
  - Leverage with PNNL
  - Explore new vehicles for potential value



Communications Challenges

- Building engagement with BER-funded PIs
- Being responsive to increasing scope with decreasing budget

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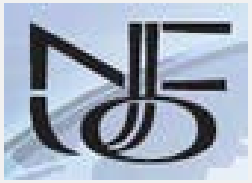

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What is the Oak Ridge Leadership Computing Facility?

- Collaborative, multi-lab, DOE/SC initiative ranked top domestic priority in *Facilities for the Future of Science: A Twenty-Year Outlook.*
- Mission: Provide the computational and data science resources required to solve the most important scientific & engineering problems in the world.
- Highly competitive user allocation program (INCITE, ALCC).
- Projects receive 100x more hours than at other generally available centers.
- LCF centers partner with users to enable science & engineering breakthroughs (Liaisons, Catalysts).

Titan

Cray XK7

Currently #2 HPC Top 500

27 petaflops

299,008 Processor Cores

18,688 GPUs

Defining OLCF User

Compute and Data Resources

- Multiple computing, data, and support resources
- Large number of interwoven hardware and software pieces
- Available 24x7
- Upgrades
  - Occur during project allocation period
  - Levels of impact vary

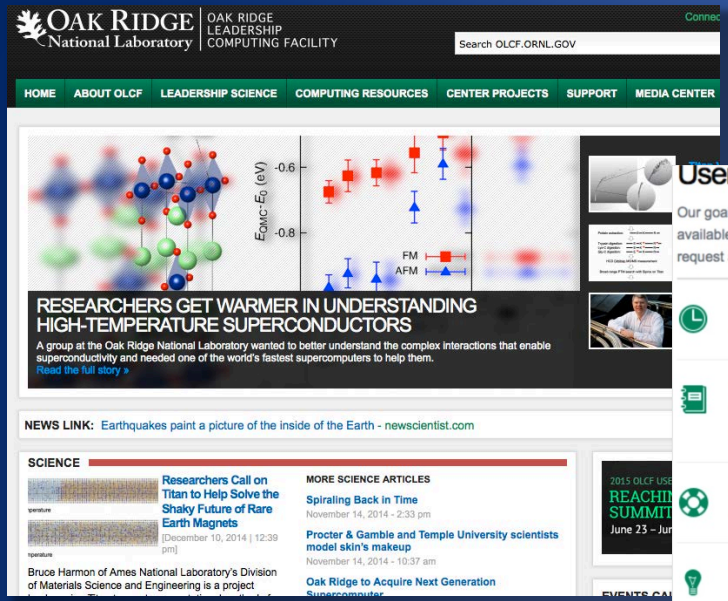
OLCF User

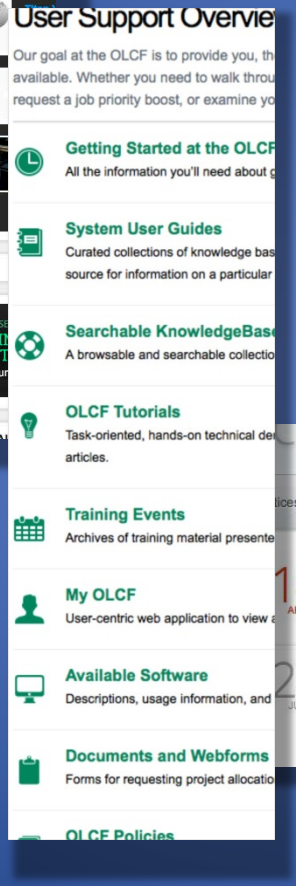
- Remote access from around world
  - Access from office, home, other
  - Users have varying work hours
- Access period to use allocated resources may span months to years
- Multiple science categories with differing codes and workflows
- Various levels of experience

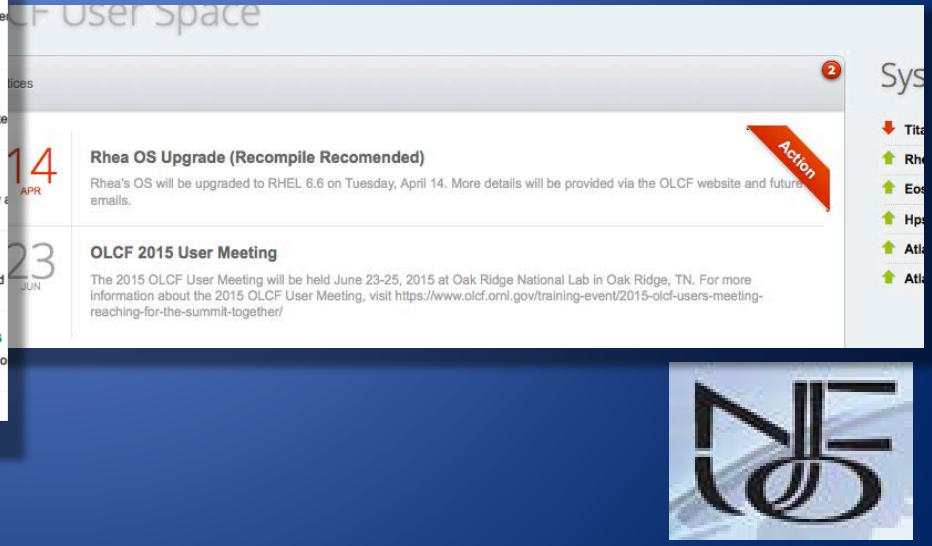
User Outreach

- Communicate instructions to aid access and use of center resources
- Outages, Notable events, Changes, Resource usage reports
- System events and changes will occur
  - Must keep users informed of events as they occur or before
  - Must provide enough detail so users know what the event means to them

OLCF User Communication, Web







- Bulk of communication
  - Can cover general to detailed levels of information
  - Forms, additional avenue for input
  - System status (automated)
  - Notable events, changes, heads-up, issues, allocation usage reports

- Always available to users
- Who can see information
  - World
  - OLCF User, login
- Large resource focus
  - Content, software, automation, hardware

OLCF User Communication

- Multiple paths to information
  - May not reach all users if we rely on a single method
  - Email, Web, Messages within systems
- What impacts me?
  - Not all of our outages, changes, or events impact all users
  - Provide all information to all users: less likely to reach target audience
    - Email filters, spam box, ignored
    - Too frequent
    - Too long: *I'll read it later*
  - Providing a subset of information to targeted users: more likely to reach users who need to know
    - Multiple email lists
    - Messages displayed on Titan

Challenges

- Web Navigation
  - Users must be able to find data for it to be useful
  - Multiple routes within web site
- Web Updates
  - Keeping information up-to-date
  - Knowing when to add new
  - Removing out of date information
- User Feedback
  - Helps to guide decisions
  - Monthly conference calls, Surveys

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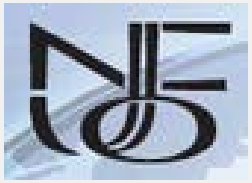

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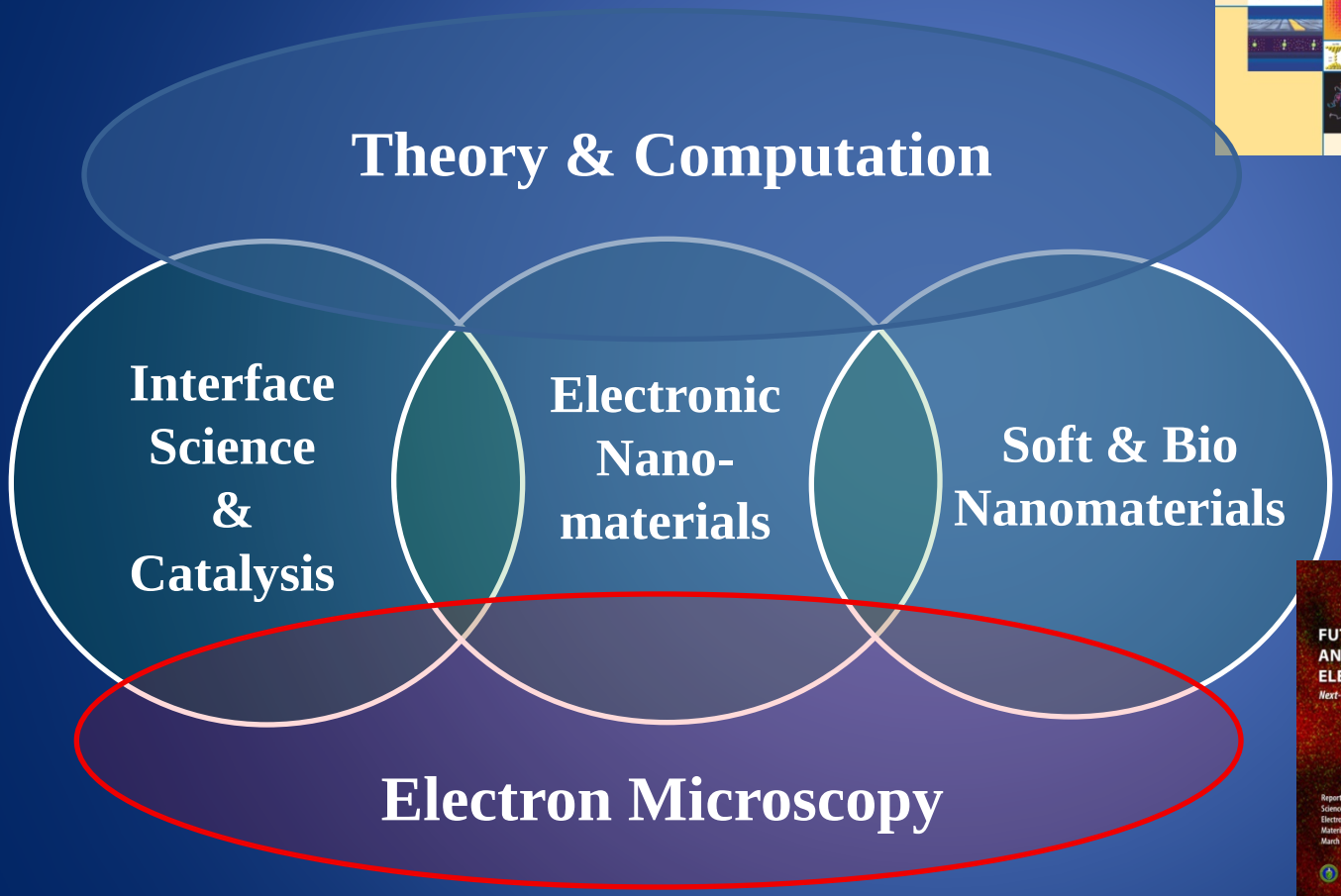
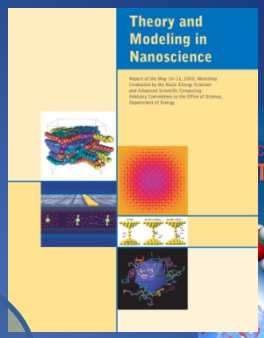
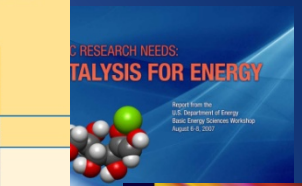
The Center for Functional Nanomaterials (CFN)

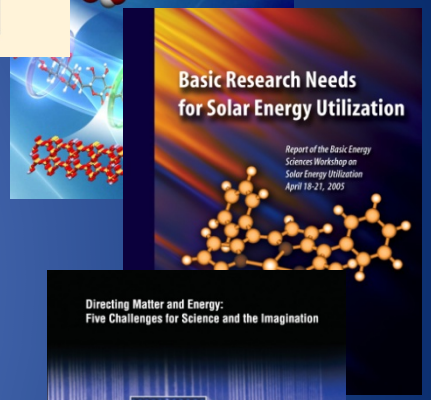
CFN's In-House Scientific Program

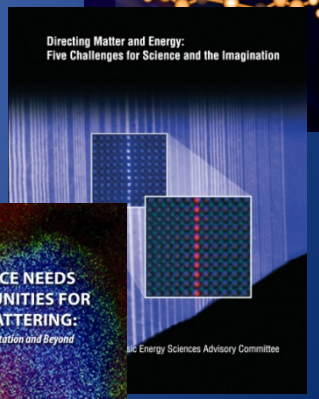
Aligned with the missions of the Department of Energy and Brookhaven National Laboratory

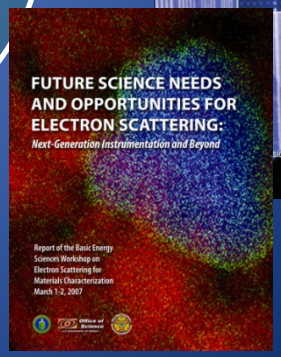












CFN's User Science Realized through Facilities

Create, Characterize, & Understand

Materials Synthesis

Nanofabrication

Proximal Probes

Electron Microscopy

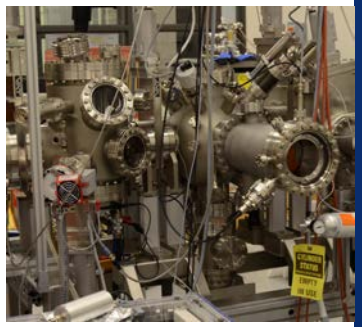
Advanced Optical Spectroscopy & Microscopy

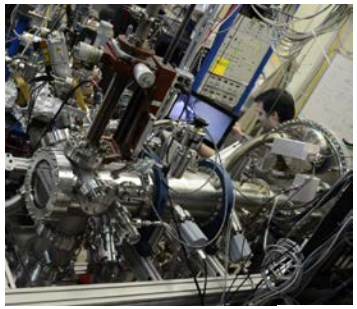
Advanced X-ray and UV Probes

Computer Cluster

Aberration Corrected ETEM

Reactor STM





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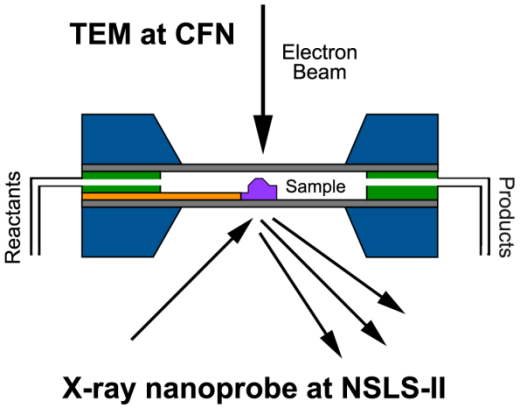

What we do well

- Scientific Expertise in:
  - Self-assembled Nanomaterials by Design for Energy-related Applications
  - Comprehensive Suite of *in operando* Probes of Nanomaterials Systems
  - Nanoscale Architectures for Energy Solutions
- Extensive Outreach Program Designed to:
  - **Train** the current User Community (e.g. Hands-On Workshops at CFN)
  - **Engage** the Scientific Community in contemporary nanoscience topics of interest to CFN (e.g. Organize International Conferences)
  - **Inform** the General Public about nanoscience and nanotechnology (e.g. Newsletter, Website, Summer Sundays)
- High Impact User & Staff Productivity
  - 473 Users (FY14) with > 220 Publications (1/3 high impact)

Challenges

- Continue to Address the Evolving Scientific Demands and Interests of the User Community
- Expand the User Demographics (Industry, Regional, International, Proprietary)
- Maintaining Up-to-Date Communication Routes
  - Social Media (Twitter, LinkedIn, etc.)
  - Website
  - Social Hours
- Establishment of a Centralized Data Management Program