SLAC National Accelerator Laboratory

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BERAC Meeting

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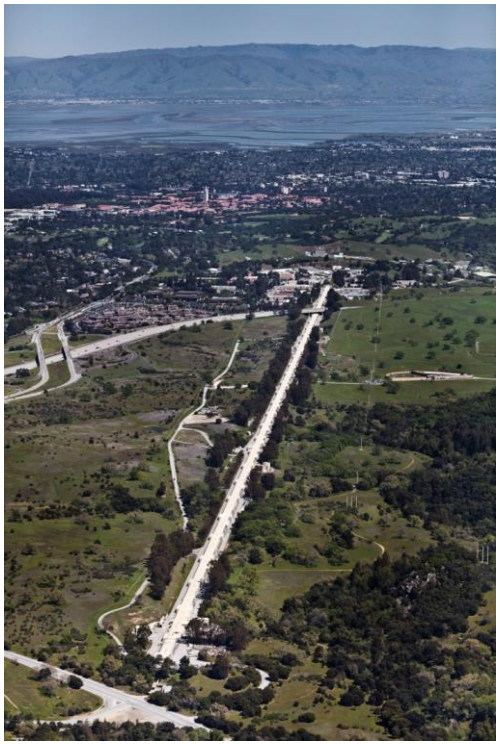
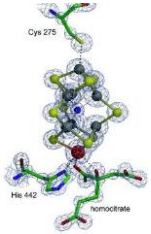
Laboratory mission and overview

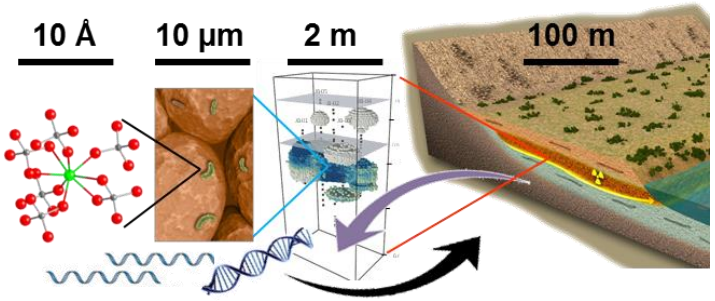
- Laboratory mission
  - Innovate, develop and operate world-leading accelerators, light sources and scientific tools
  - Deliver transformative science: materials, chemical, geochemical and biological
  - Find solutions for nation's energy challenges, including climate and environmental change
- General overview of laboratory structure and funding
  - SLAC is a 'school of Stanford' and has a strong synergy with the university
  - 1,450 employees, 55 faculty, 285 postdocs / grad students
  - 2,700 scientific facility users
  - FY 15 total budget: $433M ($300M operating)



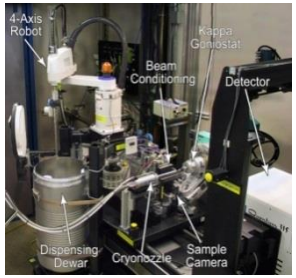
Core capabilities: research & facilities

- Current BER-related core *research capabilities*
  - Integrative structural biology, chemistry, microbiology, and biocomputation
  - Molecular biogeochemistry: nutrient and radionuclide aqueous geochemistry, soils science, molecular and microbial ecology, reactive transport modeling

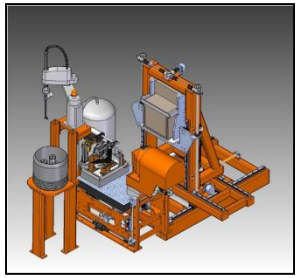




- Current BER-related core *facilities*
  - SSRL structural biology (MC, SAXS/WAXS, XAS/XES) and x-ray imaging beam lines
  - LCLS MC, SAXS/WAXS, XES and single particle imaging



SSRL BL9-2

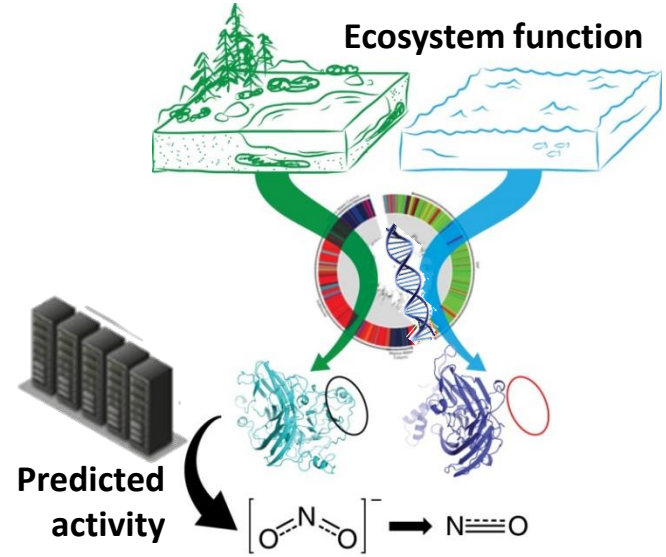


LCLS MFX

Future strategic science priorities

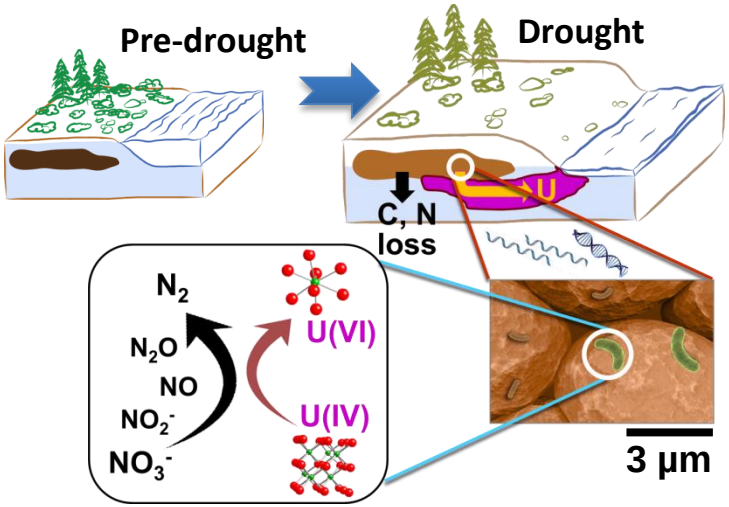
Protein structure to ecosystem function

- Metagenomes → biocomputational prediction
- Experimental "calibration"
  - protein structure / arrangement
  - activity
- Scale to ecosystems via microcosm



Molecular basis of biogeochemical function

- Understand molecular basis of ecosystem function
- Coupling of molecular scale to hydrologic cycle to understand/predict:
  - Responses to perturbation (flood, drought)
  - Nutrient and contaminant mobilization



Multiscale integrative imaging

- CryoEM/ET, super-resolution optical microscopy, UED/UEM will augment x-rays

Future strategic partnerships

Access strategic capabilities to accomplish scientific vision:

JGI: advanced genome sequencing, protein synthesis

EMSL: proteomics and mass spectroscopy imaging

JBEI: biocomputational prediction of protein structure / function in biofuels synthesis

LBNL: research at the Rocky Mountain Biological Lab field site

LLNL: advanced nanoscale imaging of isotopically labeled molecules