**Workshop Title:** Soils for a Sustainable Future

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A workshop titled “Soils for a Sustainable Future” was held during the 2018 NSLS-II & CFN Joint Users’ Meeting at Brookhaven National Laboratory, Upton, NY on May 22nd, 2018. The workshop brought together researchers with strong interest in soil science from a number of institutions including universities and national laboratories, several of them expert users at either NSLS-II or EMSL, or both. The 5-hour workshop hosted 11 speakers from 10 US institutions. The main goal of the workshop was to explore how the two user facilities, EMSL and NSLS-II, through use of joint capabilities, can help generate new science/knowledge that leads to improved processes for sustainable agriculture, biocrop production, as well as the preservation of soils as a long-term carbon reservoir.

In line with these goals and to paint the big picture, the workshop began with a plenary talk titled “The Nexus Between Soils, Climate, and Water: Big Challenges and Opportunities in the 21st Century”, delivered by Prof. Donald Sparks (Delaware Environmental Institute). To help bring together NSLS-II and EMSL capabilities that could be paired to provide new molecular insights to the biogeochemical and microbial processes involved in carbon cycling, Mark Bowden, a Capability Lead at EMSL, gave on overview of plant and soil research capabilities available at their User Facility. Next, Erin Nuccio of Lawrence Livermore National Lab talked about plant-microbial interactions for sustainable crop production. EMSL’s Kirsten Hofmockel discussed soil microbial ecology from aggregates to the nanoscale, outlining the need for multiscale characterization and connecting different scales. Marco Keiluweit (UMass Amherst) described their research on mapping carbon flow through soils, relying on a number of EMSL measurements, and discussed ecosystem-scale and global impacts of carbon flow. Next came talks about soil minerals; Owen Duckworth from North Caroline State University talked about the structure and reactivity of natural iron oxide deposits, and Colleen Hansel from the Woods Hole Oceanographic Institute presented research on biomineralization and carbon-metal interactions using coupled proteomic and spectroscopic tools. The final segment of the workshop opened with Brandy Toner’s (University of Minnesota) presentation on the effect of climate change on the coupled biogeochemistry of sulfur and mercury in organic soils. Next, Joshua LeMonte (US Army Corps of Engineers) discussed soil science applications for the US Army. Deb Jaisi of the University of Delaware showed us their research on the transfer and transformation of phosphorus from agricultural soils to open waters. The final talk was delivered by Jonathan Judy (University of Florida) who applied synchrotron-based imaging and spectroscopy tools to study the transformations of silver nanoparticles during wastewater treatment and their effects on plant-microorganism relationships following agronomic application of the sludge.

In conclusion, the workshop was a great representation of both NSLS-II and EMSL user science, while the breadth of research and measurement capabilities presented by the speakers provided participants a comprehensive overview of advanced characterization techniques for studying soils and related biological systems. Successful integration of the unique capabilities from both user facilities will surely widen achievable science and the user horizon, and could be catalyzed by coordinated access to the facilities. Management from both facilities is discussing the potential for a joint user proposal as part of an expanded FICUS call for next year.