☒ **Talk** ☐ **Poster**

XLEAP: a microfocus beamline under construction at the Cornell High Energy Synchrotron Source

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A new microfocus beamline entitled XLEAP (X-rays for Life, Environmental, Agricultural, and Plant Sciences) is under construction at the Cornell High Energy Synchrotron Source (CHESS). This mid-scale research infrastructure award (USNSF-2330043) began in April 2024, procurement and construction are under way, and the facility is planned to open for user operations in 2028. During construction, graduate students and faculty from the University of Texas at El Paso are collaborating with CHESS staff and Cornell faculty on pilot experiments that develop future capabilities and workflows for XLEAP.

The science priorities for XLEAP, driven by workshops and conferences in 2020-2023 [1], include (1) fundamental mechanisms in plant sciences, such as micronutrient uptake, transport, and storage; (2) how plants respond to external stimuli such as nanoparticles, pathogens, and environmental stresses; (3) mechanisms of elemental cycling at the root-soil interface and in soil; and (4) mechanisms of elemental uptake and cycling in aquatic flora, seaweeds, algae, and other organisms.

XLEAP will offer spatially resolved x-ray fluorescence microscopy (2D mapping, 3D computed tomography, and 3D confocal imaging), x-ray absorption spectroscopy, and x-ray diffraction, with tunable spatial resolution from >100 μm to <1 μm, energies ranging from 3-80 keV, and high-flux or high-energy-resolution modes. XLEAP will also offer users complementary optical microscopy, plant growth, and sample preparation facilities, as well as the potential for in-situ x-ray measurements with custom plant growth environments directly on the beamline. In this facility update, we will report on the beamline design and construction status, illustrate the planned experimental modes, and describe possibilities for flexible access to accommodate experiments with longer time scales.

References

[1] Smieska, L., Guerinot, M. L., Olson Hoal, K. E., Reid, M. C., Vatamaniuk, O. K. *Metallomics*, **15** (8), mfad041 (2023), 10.1093/mtomcs/mfad041