XLEAP X-rays for Life, Environmental, Agricultural, & Plant Sciences

WHAT IS XLEAP?

X-rays for Life sciences, Environmental, Agriculture, and Plant sciences (XLEAP), will build a world-leading, micro-focusing x-ray facility at the Cornell High Energy Synchrotron Source (CHESS), designed to transform the study of elemental processes in biological and environmental systems from the sub-micron to the whole organism scale. By combining state-of-the-art technology and expertise at CHESS with other world-class research facilities at Cornell, XLEAP will aid in the development of tools suited to answer fundamental questions in plant biology, functional genomics, microbiology, and environmental sciences, among many areas.

Find out more about XLEAP: https://bit.ly/XLEAP

SCIENCE PRIORITIES

XLEAP will offer researchers new experimental modes to explore dynamic changes in the ionomes of living systems. Construction of this unique facility is motivated by four urgent, scientific community–determined Science Priorities:

- Fundamental processes of nutrient homeostasis in plants
- Plant systems under external stimuli (symbionts, pathogens, nanoparticles, environment)
- Soil biogeochemistry, including plant-root-soil interfaces and biogeochemical cycling
- Micronutrient uptake and transformation in marine organisms

ADVANCING SUSTAINABILITY

XLEAP will advance scientific progress toward solving many grand challenges facing society today, including:

- Feeding a growing population with sustainable, climate-resilient agricultural methods
- Accelerating carbon sequestration via enhancements of natural biogeochemical cycles
- Sustainably extracting metals and rare earth elements of critical importance to renewable energy technologies, including biological separation approaches

Cornell University

CHESS
CORNELL HIGH ENERGY SYNCHROTRON SOURCE

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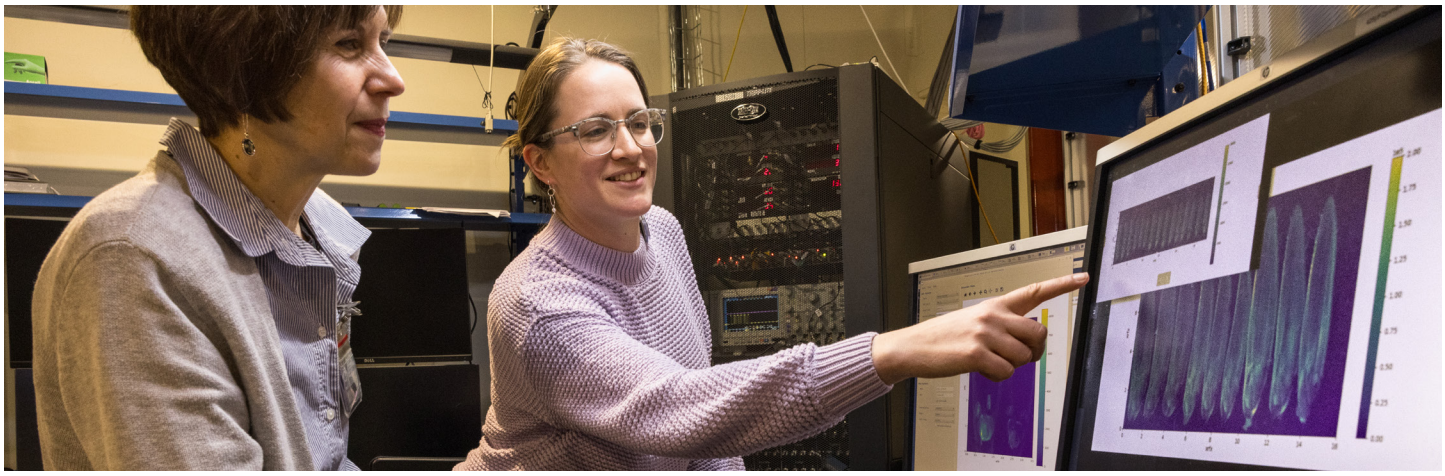

PARTNERSHIP WITH THE UNIVERSITY OF TEXAS AT EL PASO

In partnership between Cornell University and the University of Texas at El Paso (UTEP), which serves an 84% Hispanic student body, this project will engage graduate students in development and testing of new hardware and experimental methods for use at the beamline, enhancing the diversity of both the synchrotron user community and also the pool of future synchrotron postdocs and beamline scientists.

XLEAP CAPABILITES

The ability to study living plants in-situ in a customized growth chamber on the beamline will be a major advance, enabling researchers to examine genotype-phenotype relationships in non-stressed tissues. Researchers will even be able to study dynamic changes in plant tissues on multiple time scales, as XLEAP will provide both cutting-edge detectors and high-energy x-rays while minimizing radiation dose and damage to living tissue.

The proposed capabilities of XLEAP will include:

- X-ray fluorescence (XRF) elemental imaging
- X-ray absorption spectroscopy (XAS) oxidation state measurements
- X-ray diffraction (XRD) phase identification and crystallinity
- Multimodal x-ray and optical spectroscopy capabilities
- Plant growth and sample prep facilities on site

WHY CHESS?

CHESS is a high-intensity X-ray source providing users state-of-the-art synchrotron radiation facilities for research in Physics, Chemistry, Biology, and Environmental and Materials Sciences. Buried 40 feet beneath the Cornell campus is the 768 meter Cornell Electron Storage Ring (CESR). CESR is used as a high energy X-ray source for CHESS, bringing in thousands of researchers each year. While other synchrotron laboratories are traditionally located at national labs, Cornell is the only U.S. university operating a large accelerator complex.

Why Cornell? Cornell is New York's Land Grant University, providing a robust agricultural and environmental research community and resources including the School of Integrative Plant Science.

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