

Enhancing Analysis

Supercomputing boosts Wooster genetics lab

■ AGRICULTURAL AND VETERINARY SCIENCES

The Ohio State University Molecular and Cellular Imaging Center (MCIC) serves as a shared technology laboratory to facilitate research in microscopy, genomics and bioinformatics. Since its founding in 2000, the center has grown into a data-intensive operation that has thrived in partnership the Ohio Supercomputer Center (OSC).

As the MCIC expanded over the years, the center acquired Illumina, a high-throughput genetic sequencing (HTS) system to identify the order of nucleotides in a DNA segment. Sequencing often proves to be invaluable in genetic work: DNA abnormalities can be indicators of disease and other areas of concern. The incorporation of HTS methods allowed the center to dramatically improve its efficiency, up to sequencing an entire genome at once.

Tea Meulia, MCIC director and adjunct associate professor of plant pathology, realized the volumes of data generated and processed by HTS required more computational power than she had at her disposal. She turned to OSC to take the MCIC's computing operations to a new level.

"As this new instrument was acquiring terabytes of data at once, we needed support for storing and analyzing data, and OSC provided us with the infrastructure for short-term storage of the sequencing runs to perform the analysis," Meulia said. "Throughout the years our needs have changed, but we have been consistently using OSC infrastructure in one way or another."

Over the past several years, Meulia has worked to migrate all analyses at MCIC from local servers to OSC. This infrastructure now supports ongoing work across the Ohio Agricultural Research and Development Center, part of Ohio State's College of Food, Agricultural, and Environmental Sciences (CFAES).



Photo: A researcher and a student utilize the Molecular and Cellular Imaging Center (MCIC) in Wooster, Ohio.

"CFAES research encompasses the improvement of agricultural food production and quality and maintaining agrosecurity, study of the environment and ecosystems and the development of advanced energy technologies and bio-based products," Meulia said. "Our bioinformatics laboratory has the opportunity to work on very diverse projects with faculty. In this past year we have been involved in several [projects] utilizing OSC resources."

For example, the MCIC's bioinformatics group has helped Anne Dorrance, Ph.D., study the development of disease resistance in soybeans. Dorrance, associate dean and director for Ohio State's Wooster campus and associate director for the Ohio Agricultural Experiment Station, has assembled and annotated several soybean genomes using OSC resources. Resistance markers can then be identified and introduced into germplasm—plant material from which new individuals can be cultivated—and then grown successfully with added disease resistance.

"OSC has provided the computational infrastructure to perform analyses that otherwise would not be possible, as they cannot be done on personal computers, or would require a substantial investment in computing and personnel to maintain it," Meulia said. "OSC also allows for easy sharing of data with faculty and collaborators." •

Project Lead: Tea Meulia, Ph.D., The Ohio State University

Website: plantpath.osu.edu/our-people/tea-meulia