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# Synchrotrons for biology, examples from the US

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Synchrotrons have a foundational imaging role in the bioscience area. Hundreds of laboratories across the US depend on synchrotrons for their research. An exemplary, outstanding and under-appreciated outcome from the past decade is the machine learning (ML) based protein structure prediction. Training the ML relied on the imaging of thousands of structures generated by a large crystallography community at synchrotrons. The synchrotron community can follow this strategy to provide unique large data sets for ML training and further major insights and breakthroughs in biology. As in the case of crystallography, no single lab can produce the diverse biological material that is needed to train ML and solve a general problem. Synchrotrons have well developed user programs and provide sufficient access to foster large communities. User communities in scattering, footprinting, and spectroscopy are particularly well positioned to generate such data sets and outcomes if properly supported. Further, synchrotrons are uniquely situated to combine information from these techniques and provide multi-modal and multi-scale information that together provides greater insight than the techniques applied individually. I'll provide examples from the Advanced Light Source of efforts to create collection infrastructure at scales sufficient to make use of ML and examples of multi-scale imaging. Recent examples stem from cross-synchrotron and neutron studies that addressed COVID19.

## Select Topic 1

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