

# RapiData at SSRL - Data Collection and Structure Solving: A Practical Course in Macromolecular X-Ray Diffraction Measurement

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Understanding how chemical, biochemical, and biophysical processes shape and transform the natural and physical world has its roots in basic research done at major laboratories. Users from academia, nonprofit organizations and industry find in core facilities an innovation hub to develop their research endeavors. These span a wide range of areas and techniques: materials science, energy, chemical science, bioscience, and engineering. Supporting structural biology, the major hubs include synchrotron, neutron, and cryo-EM facilities. Synchrotron radiation is an indispensable tool in macromolecular crystallography and most of the macromolecule structures deposited with the Protein Data Bank are solved and refined with data collected at synchrotron sources. Some of the skills needed to make optimal use of state-of-the-art beamlines and data processing and analysis software are difficult to learn without intensive training. The Stanford Synchrotron Radiation Lightsource (SSRL) at the SLAC National Accelerator Laboratory runs the "RapiData" practical course to educate the next generation of users and pass on tips, tricks, and new developments in macromolecular X-ray diffraction data collection, data processing, and structure solution. The focus of RapiData is hands-on training and the students are encouraged to contribute samples from which data is collected, and also data that has already been collected at SSRL or elsewhere, for use in data processing tutorials. Offering lectures and training sessions from the fundamentals of crystallography to specific techniques on modern software for data collection and processing at synchrotron beamlines, RapiData is ideally suited for the novice and the seasoned user. Specialists lecture on specimen preparation, data collection tactics, tackling the structure solution problem, spectroscopy and small angle scattering, data collection at elevated temperatures, crystal dehydration, radiation damage mitigation, and serial crystallography. Continuing its mission since 2015, RapiData at SSRL offers a training ground for young scientists using state-of-the-art software and synchrotron instrumentation.