Increasing capabilities at GM/CA@APS beamlines during the APS Upgrade

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The Advanced Photon Source (APS) will shut down in April 2023 for a year-long upgrade (APS-U) to replace the storage ring. The APS-U will start up in April 2024 and be up to 500-times brighter than the current APS. The GM/CA@APS beamlines also will be upgraded with new X-ray optics that will focus the full beam to 5 microns with mirrors (JTEC Corp. mirrors and benders built by AXILON AG) or ~1-micron with Compound Refractive Lenses (RXOPTICS GmbH & Co. and a transfocator built by AXILON AG). Growing evidence suggests that radiation damage can be reduced by using X-ray energies well above the usual 12 keV, and with micron-sized beams. To exploit this, we plan to purchase a DECTRIS Eiger2 detector with a CdTe-sensor that has high efficiency for energies well above the beamline maximum energy of 35 keV. The sample capacity of our automounters will be increased to support higher throughput. The recently-released PyBluIce control software will incorporate additional advanced features, including automated data collection, while retaining the power and flexibility of the previous control software, JBLuIce. Analytical software developments and coordination with the Argonne Advanced Leadership Computing Facility will provide increased speed of data analysis. These upgrades will provide enhanced room-temperature and cryo-cooled serial crystallography capabilities, whether with viscous flow jets [1] or fixed-target [2] sample delivery systems. For cryo-cooled samples, efforts are in progress to minimize the movement of the sample as the pin-base thermally equilibrates after transfer from the Dewar to the goniometer. Once the X-ray beam is available in April 2024, we will begin recommissioning the beamlines, and after a few months, start ramping up the user program. Researchers are encouraged to apply for GM/CA@APS beamtime, whether for advanced techniques such as room-temperature serial crystallography, or for ‘standard’ and high-throughput crystallography. We look forward to welcoming you back to the beamlines to experience some exciting new capabilities.


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