

The 2017 CHESS Annual User Meeting

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The Cornell High Energy Synchrotron Source (CHESS) held its annual user meeting on June, 26th and 27th 2017. CHESS is an NSF funded national synchrotron user facility providing high-intensity X-ray beams for over 1200 scientists a year, in fields as diverse as condense matter physics, materials science, plant biology, and art conservation. The meeting, held in the Physical Sciences Building on the campus of Cornell University in Ithaca, NY, gathered over 160 users. The meeting was designed not just to give the CHESS user community an update on the current status and capabilities of the lab as well as future planned upgrades, but also to provide an opportunity for users to learn from each other about other new measurement methods and research going on in the lab and for CHESS staff to better understand the scientific questions the user community wants to answer using CHESS beamlines. This year, for the first time, the CHESS user meeting was hosted in concert with the INCREASE (Interdisciplinary Consortium for Research and Educational Access in Science and Engineering) annual meeting. INCREASE is an NSF Division of Materials Research funded organization that promotes research and education at minority-serving institutions (MSIs) with a goal to increase the utilization of national research facilities, and for research education and training for members of groups underrepresented in science and engineering research, such as African-Americans, Hispanics, and women (<http://www.increaseonline.org/>).

The meeting began with a plenary session. Following introductory welcoming remarks by Kyle Lancaster, User Executive Committee (UEC) chair, and Joel Brock, CHESS director, talks were given to update the community on the current state of various components of the lab as well as the status of the on-going CHESS-U upgrade. Mark Weidman (MIT), was awarded the student paper prize and presented a talk on

the “Kinetics of the self-assembly of nanocrystal superlattices measured by real-time *in situ* X-ray scattering”. The balance of the morning session was a discussion of the new funding model for CHESS. Joel Brock and Guebre Tessema, our NSF program director, spent the balance of the morning jointly announcing and answering questions about CHESS’s new funding model beginning in 2019. The NSF is switching from being a steward of CHESS to a partnership model. With NSF’s encouragement, CHESS has a new opportunity to partner with industry, universities, and other national labs and agencies to seek out new scientific opportunities and funding, allowing CHESS to continue to push the boundaries of X-ray science and make the best use of our upgraded capabilities.

Following lunch was a series of five keynote addresses from a variety of CHESS users across the multidisciplinary spectrum: from a talk entitled “Resonant X-ray scattering studies of competing order in spin-orbit Mott states” by Stephen Wilson (University of California Santa Barbara) to a talk by Brian Zoltowski (Southern Methodist University) on “Chemical Integration of Circadian and Photoperiodic Clocks in Plants”. Following these talks the results of the UEC elections were announced: Todd Hufnagel, Johns Hopkins University, and Jiye Fang, University of Binghamton, were elected to the UEC (Meredith Silberstein, Cornell University, will be stepping down).

Following the announcement of the new UEC members the poster session began. The session included over 50 posters with a range of topics. As always, two poster awards were given: Stephen Meisburger (Princeton) won the prize for the best technical poster for his work on “Unmixing Enzyme Allostery” and Thomas Derrien (Cornell) was awarded the



Figure 1. (Colour online) Staff scientist Arthur Woll discusses a poster with a user during the 2017 CHESS User Meeting poster session.

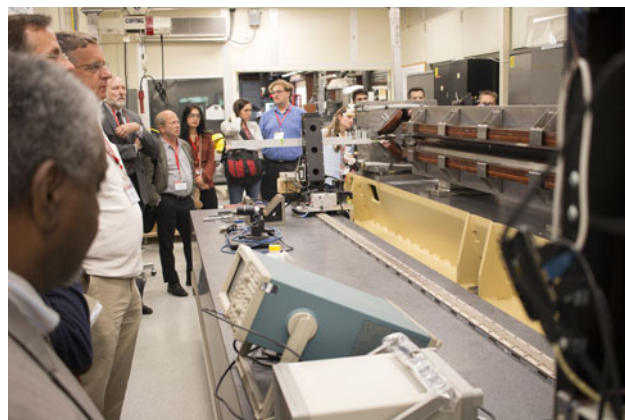


Figure 2. (Colour online) Users tour the magnet construction and testing facility and learn about ongoing efforts to build magnets for the CHESS-U upgrade.

prize for the best scientific poster for his poster on the “Dynamics of DNA-Capped Nanoparticle Superlattice Assembly”. During this time there was also a tour of the new magnet construction and testing facility in the Wilson lab annex where attendees learned about the ongoing work preparing for the CHESS-U upgrade. Following the poster session was the annual User Meeting dinner with an engaging talk by Robert P. Crease (Stony Brook University) entitled, “The Quantum Moment: How Quantum Language and Imagery Escaped the Lab”.

The second day had three parallel sessions: in addition to the INCREASE annual meeting, there was a session focused on biological applications and one on engineering applications. The former was entitled “Emerging Frontiers in Biology using Synchrotron Radiation” was hosted by CHESS staff Scientists Aaron Finke and Arthur Woll. The first half of the workshop focused on “Advances in Serial Synchrotron Crystallography”. Serial crystallography makes use of high-intensity X-ray beams and fast detectors to rapidly measure the diffraction, in series, of many protein microcrystals in order to resolve their structure at room temperature and without the need for producing the large crystals needed for conventional protein crystallography. The afternoon session was motivated in part by CHESS’s new capabilities using the Maia detector to map elemental compositions leaves and other biological materials. The symposium title was “Chemical and Structural Imaging in Biology”.

The other session was hosted by CHESS staff scientist Darren Pagen. It focused on the kinds of problems that the InSitu program works on at CHESS, using the F2 and A2 beamlines: using X-rays to look at the effects, at both the atomic and microstructural level, of stress and strain and correlate them to mechanical properties of engineered materials. The morning session was entitled “Measuring and Modeling Damage Evolution” and discussed the current modeling efforts for looking at the crack and void formation and the interplay between this modeling work and the experimental results being produced at CHESS and elsewhere. The afternoon session, entitled “Quantifying Stress using X-ray diffraction under Multiaxial Loading Conditions”, talked about new experimental approaches for use X-rays as an *in situ* probe to measure the effects of loading in three dimensions. Traditionally, the vast majority of both *in situ* and *ex situ* mechanical testing is done using uniaxial forces, which is very different from the loading conditions these materials experience during their typical service life.

Additional information about the meeting including recorded talks is available at the meeting website: <http://meetings.chess.cornell.edu/UserMeeting2017/index.html>. The Cornell High Energy Synchrotron Source (CHESS) is supported by the National Science Foundation under award DMR-1332208. Beamtime proposals for the winter and spring run are currently being accepted with deadlines of December 1st and February 1st, respectively. For more information visit our website: www.chess.cornell.edu