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Eric Brown

Photo by Ethan Frogget, IRM-CAS

As P-23 Group Leader Eric Brown oversees an organization that pursues a broad spectrum of science, from studies of plutonium (left, Pollux experiment) to underground probings into the most basic nature of matter (right, MiniBooNE experiment).

“...we have a rich pool of new scientific discoveries that are just beyond our fingertips right now.”

Charting clear passages for physics research around the globe

By Diana Del Mauro, ADEPS Communications

Early in his career, Eric Brown measured his productivity as a scientist by publishing a peer-reviewed paper nearly every month. During a two-year change-of-station assignment at the Pentagon, however, he discovered satisfaction in the planning and program execution that enables big science. When he returned to Los Alamos National Laboratory in 2010 he sought a balance.

Now, as the new group leader for Neutron Science & Technology (P-23), Brown said he feels prepared to lead a crew of 90 and guide its broad sweep of physics, which ranges from dark matter detection to applied weapons experiments. “I continue to be excited and amazed by the breadth and depth of the people, science, and mission of the group,” said Brown, who previously served as a P-23 deputy group leader.

“Eric has an in-depth understanding of the work conducted within P-23 and has strong connections to the national and international dynamic materials community,” said Physics Division Leader Doug Fulton in announcing Brown’s new role.

During nine months in 2011 as acting group leader, Brown gained a deeper understanding of the P-23 teams, the collaborators, and the science. He said the group is unlike any other in Physics Division because of the large amount of off-site work, both across the United States and abroad: “It is not uncommon for two-thirds of staff to be on the road.”

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From Doug's desk...

Colleagues:

It has been approximately three years since our visit by the American Physical Society Committee on the Status of Women in Physics. I was reminded of this as I just met with CJ Bacino, Program Manager for Diversity and Strategic Staffing, and Susan Seestrom, ADEPS, to discuss our yearly progress on diversity within the division and directorate. To summarize, we have made progress in doubling the percentage of female postdocs, now at 20% of the population, and have made little progress elsewhere. To reiterate the policy that I promulgated a few years ago: we will hire the best candidate in all cases as determined by those candidates who rank best against the documented requirements of each job. However, my expectation is documented by this quote from P-DO-11-11: "Hiring organizations must strive for a diverse applicant pool in the hiring of Permanent employees and Postdocs. At a minimum, the diversity of the candidate pool must be documented. If the candidate pool is not diverse, as determined by comparison with HR Placement Goals, the efforts to increase the diversity of the candidate pool must be documented. If this effort is deemed insufficient by the Division Leader, the process may be extended until sufficient effort has been documented." I ask that you all strive to ensure that our hiring pools for all jobs are diverse and that we all work to make Physics Division a welcoming place for all prospective employees.

Physics Division Leader Doug Fulton

“
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”

Doug

HAWC Gamma-Ray Observatory begins; collects first data

The High Altitude Water Cherenkov Gamma-Ray Observatory (HAWC), being built at 14,000' elevation in Mexico, will consist of 300 water Cherenkov detectors each holding 50,000 gallons of water and 4 large photomultiplier tubes. The first 30 of these detectors were completed in September 2012 and have been operated intermittently over the last few months. The data from these first few months have been verified with the strong detection of the deficit in cosmic rays from the direction of the moon.

Cosmic rays are charged, energetic particles that are believed to be accelerated by shocks in the remnants of supernova explosions. The cosmic rays arrive at Earth from all directions due to random deflections by the magnetic fields within the Galaxy. Because the cosmic rays do not pass through the moon, the moon creates a cosmic-ray shadow. The shadow is not precisely in the direction of the moon because the cosmic rays are further deflected by the Earth's magnetic field. The amount of the deflection is proportional to the energy of the cosmic rays and thus confirms the energy range of cosmic rays detected by HAWC.

An illustration of the HAWC observatory under construction with Pico de Orizaba in the background. The platform of ~150 m x 200 m has been leveled and ~70 of the 300 water Cherenkov detectors have been built as of February.

The construction of HAWC continues and full-time operations will begin this summer with one third of the detector. At such a time HAWC will be the most sensitive, wide field of view, continuously operating gamma-ray observatory in the world. HAWC will detect the highest energy gamma rays ever observed from astrophysical sources, such as supermassive black

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Brown cont.

P-23 is on a solid course scientifically and financially, with a full load of funded projects, according to Brown. He predicts no sharp turns, but he hopes to make P-23's research more visible. For instance, Brown wants to create opportunities for scientific staff members to talk to U.S. Department of Energy decision-makers in person.

Brown grasps the challenges both sides face, having acquired first-hand knowledge as a program manager for the Laboratory's Associate Directorate for Weapons, an action officer for the NNSA Science Campaign and the Inertial Confinement Fusion program, and a scientific advisor for the Office of the Undersecretary of Defense at the Pentagon.

To keep P-23's scientific reputation thriving, Brown encourages staff working on applied programs to keep one foot in classified weapons research and the other foot in publishable basic research, as he did. Peer review and outside collaborations help researchers grow and stay "on the forefront of the science we do," he said.

P-23 group leader is "an exciting post to be in," Brown said, "because we have a rich pool of new scientific discoveries that are just beyond our fingertips right now." On the group's weapons program side, the Gemini experiment has been "an important success," he said, for studying the behavior of plutonium. P-23 researchers are now taking the scientific lead in a new weapons experimental program at U1a in Nevada. With the National Ignition Campaign concluding last year, P-23 continues to work at the National Ignition Facility and make significant contributions to the Inertial Confinement Fusion program. "There is a future to be had there; we're working to define our role," Brown said. In fundamental research, the High-Altitude Water Cherenkov Gamma-Ray Observatory (HAWC), the MAJORANA underground neutrino experiment, and the MiniCLEAN dark matter experiment will soon be collecting data, enabling new discoveries in astrophysics and particle physics.

For Matter-Radiation Interactions in Extremes (MaRIE), the Laboratory's proposed experimental facility for the discovery and design of advanced materials, P-23 scientists will help define the physics behind some of its key capabilities and develop first experiments. "I spent time in the materials division here, so (MaRIE's mission) is something I resonate with," said Brown, who has a PhD in theoretical and applied mechanics from the University of Illinois at Urbana-Champaign. Brown joined the Laboratory in 2003 as a Director's Funded Postdoctoral Fellow in the Materials Science and Technology Division.

The cosmic-ray shadow of the moon as observed by 30 of HAWC's water Cherenkov detectors. The color scale shows the significance of the detection in standard deviations. The shadow is larger than the moon, which is the size of the white dot, due to the deflection of the charged cosmic rays by the Earth's magnetic field and due to the angular resolution of this early, uncalibrated HAWC data.

HAWC cont.

holes, supernova remnants, and neutron star winds. HAWC will produce a survey of the sky to look for sources that may not even emit in optical or x-rays or radio, such as clumps of dark matter that are self-annihilating into gamma rays.

The HAWC collaboration is composed of ~150 scientists from Los Alamos National Laboratory's P-23 and Subatomic Physics (P-25), 15 universities in the United States, and 15 in Mexico. Brenda Dingus (P-23) is the U.S. spokesperson of the collaboration and the deputy project manager. The construction funding for HAWC comes from DOE Office of Science's High Energy Physics program, the Laboratory's LDRD program, the National Science Foundation, and Consejo Nacional de Ciencia y Tecnología (Mexico's science funding agency).

Technical contact: Brenda Dingus

APS DFD meeting Résumé Help Desk, formed by Prestridge, a big success

The 65th annual meeting of the American Physical Society Division of Fluid Dynamics (APS DFD) was held in November 2012 in San Diego and among the highlights was the Résumé Help Desk, where meeting attendees could have their curriculum vitae reviewed by DFD members experienced in hiring.

The help desk is one activity of the DFD's Committee on Educational and Career Outreach, formed in 2010 by Extreme Fluids Team Leader Kathy Prestridge (P-23). For more information, please see www.aps.org/units/dfd/meetings/meeting.cfm?name=DFD12.

The Extreme Fluids Team (www.lanl.gov/projects/shocktube) is in the process of commissioning its new Vertical Shock Tube Facility at the Los Alamos Neutron Science Center (LANSCE) for performing research on Richtmyer-Meshkov Instabilities. Funding is derived from Science Campaigns 1 and 4.

Technical contact: K. Prestridge

Above: Help desk volunteers frequently had long lines of students and postdoctoral researchers waiting for their advice.

Below: Karen Flack (United States Naval Academy) reviews the curriculum vitae of Rohit Nehe from Michigan State University.

“Given the competitive job market, it is important that applicants present themselves in the best way possible. Having a fresh set of eyes look at your C.V. can be extremely helpful, and the folks at the help desk are all experienced at hiring in the fluid dynamics field.”

Kathy Prestridge

The figure consists of two parts. The left part is a schematic diagram of the experimental setup, showing a cross-section of the target assembly. It includes a Detonator, TNT, Composite Booster, PBX 9501, Acetal, Ta - 2 mm, Vacuum, Velocity probes, and Machine Roughened Sn Target. The right part is a circular target design with labels: LDV, LN Pins, Ra = 32 μm, and dimensions for R(1st shock) and R(2nd shock). The target design shows a central core with a radius of 3.9 mm, surrounded by a layer of LN pins, and an outer layer with a radius of 15.32 mm. The target is designed to be machine roughened with a surface roughness of Ra = 32 μm. The dimensions for the first and second shock waves are given as R(1st shock) >= 54 mm and R(2nd shock) >= 42.5 mm.

Experimental package geometry is on the left. The diagnostic geometry, including piezoelectric pin heights, is shown on the right.

First of their kind uniaxial 2nd shock ejecta data taken

First and second shock ejecta measurements have been taken in a special system on tin (Sn) samples to characterize the total mass ejected from surfaces subjected to a second shock. The data are important because they are the first of their kind in a uniaxial two shockwave system. The measurements prove the uniaxial concept and the measurements reveal striking behavior: the “lumpy” nature of the second shock surface, and the evidence of uneven material damage in the LDV (laser Doppler velocimetry) and LN (lithium niobate piezoelectric probe) data. The uneven damage and spall observations imply wide variations in the amount of ejected mass caused by second shockwaves at the surface, and thus unpredictable mix behavior in the presence of a gas. The dynamics also imply development of a second shock ejecta model will be fraught with much more labor than was involved in development of a first shock ejecta model, a model now being implemented in the Los Alamos FLAG hydrodynamic code. Nevertheless, at this time the researchers’ primary assumption is that the second shock ejecta model will be largely based on the first shock ejecta model.

The ability to vary the first shockwave loading stress is important. Researchers achieved this result by using the low C-J (Chapman-Jouguet) state calcitol HE (high explosive) in the lowest pressure case ($P_{SB}=18.5$ GPa) and by using different amounts of TNT and PBX 9501 in the second and third cases ($P_{SB}=24.4$ and 26.4 GPa). The second shock-wave amplitude was about 0.6 mm/ μ s in all three cases.

Researchers need to test the capability to vary the second shock amplitude, and intend to do so in FY13. Estimating the loading pressure of the second shockwave is difficult with the CTH modeling software. CTH is a multi-material, large deformation, strong shockwave, solid mechanics code developed at Sandia National Laboratories. CTH does not have a three-phase EOS (equation of state) for Sn. However, earlier work by Paulo Rigg implies that the second shockwave stress is probably on the order of 7 GPa, maybe a little higher. The correct way to estimate the stress of the second shock requires estimating the temperature and material phase of the Sn after first shock. Then, simulation must be run on Sn at this temperature and pressure prior to the arrival of the second shockwave. The geometry would require adding attenuators to vary the velocity of the material after shock to about 0.6 mm/ μ s (observed). The pressure at breakout would give a good estimate of the second shock-wave stress.

This project is led by William Buttler (P-23) in collaboration with Frank Cherne (Shock and Detonation Physics, WX-9) and funded by Science Campaign 2 under Russell Olson and Rick Martineau. The Sn targets are manufactured in Polymers and Coatings, MST-7, by Derek Schmidt's target fabrication team L2 MILESTONE: Provide initial 2nd shock data set with tuned HE drive. Due: 3Q FY13

Technical contact: William Buttler

Velocimetry measurements from the three ejecta experiments. The yellow arrows on the left estimate the first and second shock velocity jumps. In the higher pressure experiments the second shock velocity jumps are not so clear.

HeadsUP!

Good housekeeping equals good safety

In this season of spring cleaning, the Target Fabrication Facility (TFF) has a success story to share.

Last year, TFF residents, which includes members of Polymers & Coatings (MST-7), began a massive cleanup effort in their 85,000-square-foot facility. In addition to recycling 15 tons of metal and 2 tons of wood, the group eliminated 170 boxes of documents, downsized from 45 to 9 safes, and sent 250 notebooks to Records Management. A new chemical stock room, where 3,000 chemicals were consolidated, reduces the number of chemicals needed to be ordered and promotes sharing common resources with other facilities.

In the process the residents changed the culture so excess materials won't pile up again. The group has restored a sense of pride in time for the TFF's 30th anniversary and set an example of how to Clean the Past, Control the Present, and Create a Sustainable Future, three long-

Commonly used chemical supplies are now consolidated in a well-organized stock room.

term Laboratory Environmental Management System Environmental Stewardship & Sustainable Strategy goals in the FY13 Site Sustainability Plan.

In recognition of their efforts, the "TFF 30th Anniversary Housekeeping Initiative" received a Silver Award in the Change Agents category for the Laboratory's 2013 Pollution Prevention Awards.

PhysicsFlash

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For past issues see www.lanl.gov/orgs/p/flash_files/flash.shtml

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Celebrating service

Congratulations to the following Physics Division employees celebrating service anniversaries recently:

Andrew Obst, P-23	35 years
Adam Martinez, P-23	15 years
Jose Taccetti, P-24	15 years