College of Liberal Arts & Sciences
Arizona State University

PHYSICS FLASH

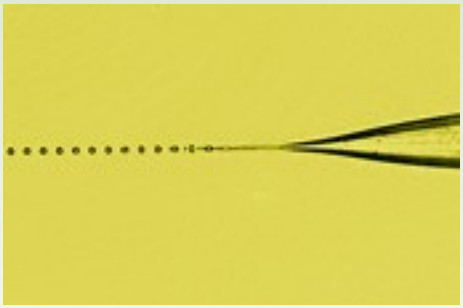
News from the Department of Physics ~ August 2009

Research image a finalist in global competition

ASU Physics research professor Uwe Weierstall's image of microscopic water droplets is a finalist in the 2009 Nikon Small World Competition. Nikon began the annual competition in 1974 and for the last 35 years, it has developed a reputation as "a leading showcase for photomicrographers from the widest array of scientific disciplines" as noted on the competition's website.

Uwe Weierstall

The photograph is a stroboscopic image of a periodic linear stream of microscopic water droplets produced by break-up of a contiguous stream of water



Droplets emerging from a nozzle in an x-ray diffraction study

emerging from a microscopic nozzle. Any stream of liquid will break up in a similar fashion due to the well-known "Rayleigh Instability."

Here, however, the instability is intentionally *triggered* by applying a slight acoustic vibration to the nozzle tube. This *locks in* the breakup process to the frequency of the piezoelectric

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2009-2010 academic year begins, brings new students into ASU Physics community

Despite the hectic nature of the weeks leading up to a new fall semester, it is a time full of enthusiasm and energy. That was certainly the case this August as ASU Physics welcomed new undergraduate majors and graduate students through two key events.

ASU Physics Chair Robert Nemanich talks about department research with new graduate students

Graduate students participated in graduate orientation August 17-21. The orientation is intended to familiarize students with the ASU Physics graduate program including various research areas, teaching assistantships, and department facilities.

The week-long orientation culminated in a welcome reception at the home of Professor Fernando Ponce on Friday, August 21. The reception was a special opportunity for faculty to get to know the people who will shape the study of physics in the future.

New undergraduate majors were introduced to the department through the Fall Welcome held on Friday, August 21. Parents and new undergraduates were greeted by ASU Physics Chair Robert Nemanich and other department personnel before embarking on a tour which included hands-on lab demonstrations.

New undergraduate physics majors investigate various lab demonstrations during Fall Welcome

The university as whole is experiencing record enrollment numbers this year and nowhere is that more evident than in the ASU Physics undergraduate program. The number of undergraduate physics majors at ASU has increased by 50% since 2007.

With orientation now under their belts, the new graduate and undergraduate class embark upon programs that are among the most rigorous on campus. The department wishes them well in the coming academic year!

Special thanks to everyone who helped make these two events a tremendous success, especially Graduate Coordinator Araceli Vizcarra, Graduate Program Director Bruce Doak, Academic Advisor Sabrina Mathues, Interim Undergraduate Program Director Barry Ritchie, General Studies Program Director Carl Covatto, Lab Manager Tim Cook, Lab Coordinators Iwonna Rzanek and Wayne Easterling, and Sharon and Fernando Ponce.

Photo competition (Continued from Page 1)

vibrator, resulting in identical droplets in a perfectly periodic, single-file train.

The ASU Protein Structure Group, comprised of Regents' Professor John Spence, Weierstall, and professors Bruce Doak, Kevin Schmidt, and Petra Fromme, is now using similar nozzles to inject complex biomolecules (e.g., proteins) into x-ray beams in order to measure the molecular structure of the biospecies via x-ray diffraction. The liquid droplet streams developed by the ASU group offer the only means of maintaining a biospecies in a fully hydrated state during injection into the vacuum chamber of an x-ray beam.

For more information on the nozzle in this image, click HERE. For information on similar nozzles for x-ray diffraction studies of complex biomolecules, click HERE.

The image will be featured on Nikon's website once the 100 finalists are ranked. Weierstall expects to be notified of his final ranking around mid-October. Visit the Small World website to see the incredible images from the competition's 2008 winners and stay tuned for updates on Uwe's placement.

In the news…

ASU Physics Professor Lawrence Krauss frames the issues surrounding a manned space flight to Mars in a recent op-ed piece in the New York Times. According to Krauss among others, the biggest obstacle delaying a mission to Mars isn't necessarily money, but tackling the problem of exposure to intense radiation from the Sun. Solving the radiation problem seems to necessitate either a much heavier spacecraft and in turn a greater fuel supply to make a return flight home; or astronauts living (and dying) back on Earth with the physical consequences of such exposure.

Lawrence Krauss

Krauss invites readers to consider a third option: a one-way flight to Mars.

From a historical perspective, major exploratory ventures have often been taken with the understanding that returning home *might* be either impossible or impractical. As Krauss notes, the pilgrims "seldom set off for the New World with the expectation of a return trip."

Of course, the difference between environments in the case of the pilgrims is much smaller than perhaps that of Earth astronauts existing on an entirely different planet. Nonetheless, the analogy helps recalibrate one's perspective on why such journeys were made in the first place and why they may be necessary in the future.

Calling all ASU Physics Alumni!

Homecoming 2009 is October 31st and the Physics Flash would like to include an alumni corner in our Homecoming issue! Send us an email with your name, degree and year of graduation, plus an update on any professional or personal successes you'd like to share. It's a great way to stay in touch!

Send your email today to phyflash@asu.edu.

Keep in touch and MAKE A DIFFERENCE with ASU Physics

Please consider supporting ASU Physics students, research, and programs. For more information, visit our website or call **480.965.6794**.

From the Chair…

Off to another great start

In these first weeks of the new academic year, faculty and instructors in ASU Physics are meeting with the tremendously energetic group of students who have overfilled our classes. Most of our classes begin with an overview of the significance of the foundational science principles to be explored in each class. The discussions go on to note how physics has played a key role in advancing the technologies that affect our everyday lives. Our students are often pleasantly surprised to learn how the principles of physics play an increasingly important role in fields as diverse as biological and medical science and technology, nanoscale science and technology, and the interplay between cosmology, astrophysics and particle physics.

Beyond understanding the fundamental principles of physics, our students apply the concepts of the scientific method to characterize the complex phenomena that occur both naturally and in our most advanced technologies. Our students observe some of these phenomena in our lecture demonstrations, and then in more depth through our excellent laboratories. Here, they work in small teams and are guided through the process of making precise measurements. They then use these results to form the basis for mathematical analysis.

This whole process seems complex to our students as they face these challenges at the beginning of the academic year. By the time they complete these courses, they are armed with considerable problem solving skills, and they appear to know that these skills will apply to the new problems facing in society in the years to come. I have heard several faculty members comment on how this year's students seem to be very thoughtful and committed to learning.

Still, the beginning of the semester is often a matter of finding the right classroom, meeting their project and lab partners, collecting the correct books, supplies and lecture room clickers, and managing Blackboard and their on-line homework systems. And of course, there is always the welcomed opportunity to meet new friends.

Behind the scenes, our staff stand ready to help at every turn. It is a pleasure to watch the way they enthusiastically welcome each and every student, and guide them through the first weeks.

From the other side, ASU faculty and instructors are just as excited about the opportunity and privilege to share their knowledge and perspectives with this group of students. I know many faculty have butterflies as they walk into their first classes, even if they have been teaching for decades.

After a couple weeks, as they always do, everyone settles into the semester and the study of physics takes center stage. I look forward to witnessing the exciting research, quality teaching, in-depth learning, and dedicated service that I know will be a part of this academic year.

Sincerely,

Robert J. Nemanich
Chair & Professor of Physics

Congratulations to Bob and Mary Nemanich who became grandparents for the first time in July!

Bob and Mary's son Todd and his wife Athena welcomed little **Cora Louise Nemanich** (8lbs, 20 1/2 inches) on July 16th at 4:40am!