Prof. Daniela Bortoletto’s Higgs boson memoirs
The Physics professor was among many key researchers at CERN when a new particle was found. Prof. Bortoletto enthralled students and community members at her first off-campus public appearance since the discovery.

On July 4, physicists working at the Large Hadron Collider at CERN in Switzerland, the world’s highest-energy proton collider, announced the discovery of a new particle about 135 times heavier than a proton. Is it really the Higgs Boson, a particle hypothesized over 40 years ago to explain the masses of all elementary particles in the universe?

More than 60 science enthusiasts ranging from teenagers to senior citizens crammed a conference room in the West Lafayette Public Library on Dec. 5 to hear from Prof. Daniela Bortoletto (pictured), who had an important role at the LHC’s CMS detector.

Excited and animated, Bortoletto described the potential Higgs discovery was like being at “a rock concert.” Thousands of scientists and graduate students were in on the work. Several of those were Bortoletto and her Purdue team, which included her husband and fellow Physics Prof. Ian Shipsey.

Since the talk was aimed at the general public, Bortoletto gave a Physics 101 lesson before launching into the process and findings the scientists had that led up to the particle’s discovery.

Using slide and diagram projection, the audience dialed in to the Italian scientist’s words and participated in a question and answer session. They came away with a better understanding of one of the top science stories of 2012.

Prof. Bortoletto is the E. M. Purcell distinguished Professor of Physics at Purdue University. Her research specialization is Experimental Particle Physics, for which she received a Sloan Fellowship, the NSF Career Advancement Award, and the NSF Career award. Professor Bortoletto has been searching for the Higgs boson for over 10 years, first at the Fermilab Tevatron and now at the LHC.
EAPS Prof. Matthew Huber named director of Purdue Climate Change Research Center

A leading Purdue University researcher in tropical cyclones and global warming has been named director of the Purdue Climate Change Research Center, the university’s interdisciplinary effort focusing on research and education in global climate change.

Matthew Huber, a professor of Earth, Atmospheric, and Planetary Sciences who has been at Purdue since 2003, will succeed Otto Doering, who has served as interim director of the Discovery Park center since October 2010.

“Professor Huber is internationally known by the climate change community for his research, particularly on the issues of tropical cyclones and global warming,” said Alan H. Rebar, director of Discovery Park and Purdue’s senior associate vice president of research.

Brain breakthrough

A new tool that could allow for faster, more comprehensive testing of brain tissue during surgery successfully identified the cancer type, grade and tumor margins in five brain surgery patients, according to a Purdue University and Brigham and Women’s Hospital study.

The tool sprays a microscopic stream of charged solvent onto the tissue surface to gather information about its molecular makeup and produces a color-coded image that reveals the nature and concentration of tumor cells.

Researchers analyzed specimens removed from the patients, but the goal is to one day be able to perform the analysis on intact brain tissue during surgery, said R. Graham Cooks, the Purdue professor who co-led the research team.

“We hope to eventually be able to perform this analysis during surgery to help guide brain surgeons so that the borders of tumors can be identified and the cancer status of a site can be established before any tissue is removed,” said Cooks, who is the Henry Bohn Hass Distinguished Professor of Chemistry. “We aren't there yet, but this was a critical step in the process. It shows we've found easily identifiable molecular patterns that can be used to diagnose the type and concentration of cancer cells.”

Purdue researchers designed the tool and collaborated with researchers and physicians at Brigham and Women’s Hospital at Harvard Medical School to perform the study. The brain surgery was performed in Advanced Multi-Modality Image Guided Operating suite and standard operating rooms at Brigham and Women's Hospital in Boston.

Wetherill dedication

The American Chemical Society and Purdue will recognize the R. B. Wetherill Laboratory of Chemistry as a National Historic Chemical Landmark with a dedication celebration on April 26 in West Lafayette, Ind.

The building has served as a center for chemical education and research in the U.S. for more than 80 years. Generations of chemists and chemical engineers have studied in the building under renowned faculty, including Purdue Nobel laureates Herbert C. Brown and Ei-ichi Negishi.

Named after local physician and lecturer Dr. Richard Benbridge Wetherill, the building was constructed in phases between 1928 and 1955.
Awards and honors

College of Science faculty had a prosperous fall and winter when it came to gathering the accolades. Here are some of the highlights.

**American Association for the Advancement of Science**

Four Purdue University College of Science professors have been awarded the distinction of fellow from the American Association for the Advancement of Science, the world’s largest general scientific society. The distinction recognizes their notable work to advance science or its applications. Fellows are elected by peer members. The new Purdue AAAS fellows are Mahdi Abu-Omar, professor of chemistry; David Nolte, professor of physics; Ian Shipsey, the Julian Schwinger Distinguished Professor of Physics; and Gabriela Weaver, professor of chemistry.

**American Chemical Society**

In January, recently retired Chemistry Prof. Mary B. Nakhleh earned an ACS award for Achievement in Research for the Teaching & Learning of Chemistry. Nakhleh is synonymous with Chemistry Education and her decades of research has helped make the Purdue University College of Science Chemistry Education program one of the oldest and best in the nation. Chemistry teachers of all levels have a lot to thank Prof. Nakhleh for. “One thing I have tried to instill in my student teachers is that you cannot be arrogant with learners. You should assume that everyone, you included, has misconceptions,” Nakhleh says. “You have to be a good listener to identify when their understanding is not quite right.”

**Association of Computing Machinery**

Computer Science Prof. Ahmed Elmagarmid became Purdue’s newest representative in the Association of Computing Machinery. ACM is the world’s largest educational and scientific computing society. Elmagarmid was named an ACM distinguished scientist in 2009. He is also a fellow of the Institute of Electrical and Electronics Engineers. Elmagarmid is the director of the Indiana Center for Database Systems and the Cyber Center in Discovery Park. He received a Presidential Young Investigator award from the National Science Foundation, and distinguished alumni awards from Ohio State University and the University of Dayton in 1993 and 1995, respectively.

Professor Elmagarmid’s research interests focus ranges on a large spectrum of foundational and application-oriented database research. He has done work in video databases, data quality and confidentiality, data integration, web service, bioinformatics and multidatabase systems. Professor Elmagarmid has written six books and more than 150 papers. He has several active grants from state and federal government agencies and the industry.
West Lafayette artist Clifford Peterson stands in front of one of his digital artworks in his “Two to the Eighth Power Zoom 2.0” series, which was installed on the third floor of Lawson Computer Science Building this fall.

The ‘Power’ of Computer Science and art

For 50 years, the Department of Computer Science has been on the forefront of computer programming and technology that helps make work and life easier.

That technology can also make the world more beautiful by helping artists create fine art digitally. The innovations found in software like Adobe Photoshop have opened up realms of creative possibility.

West Lafayette artist Clifford Peterson transforms his paintings and photographs by using Photoshop and Adobe Illustrator on his Macintosh computer. He has used computers to help create art for 30 years. In the early 1980s however, things weren’t so high-tech as they are today.

“My first involvement with computer graphics was at Purdue North Central (in Westville). This was in 1982,” Peterson said. “Those were the days when you worked with the Apple II and were using Logo language. You’d say ‘forward 100, left 50, right 75.’ You had to control literally every line segment. The advances in 30 years have been totally phenomenal.”

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Peterson’s newest series of digital art works can be found in “Two to the Eighth Power Zoom 2.0,” a new exhibit of 15 pieces permanently installed in the Lawson Computer Science Building. The installation hangs in the hallway of the third floor. Several other pieces by Peterson hang in Computer Science offices, including “Spirals left, right, and Center” in the third floor Leadership Suite.

While 15 framed works comprise “Two to the Eighth Power,” hundreds of colorful cells created by Peterson fuel the work. The cells are different explorations from the same digital photography of a lantana flower, taken in Purdue’s Horticulture Building Garden.

Within each “cell,” Peterson used multiple digital transformations to create a colorful, abstract image. Peterson let his mood dictate as some cells offer cooler colors while others are dominated by warmer tones.

“Two to the Eighth Power” starts in the middle of the row of 15 prints. It contains 128 cells, each of which is repeated and slightly transformed in one of the other 14 panels. The total number of cells is 256, which is 2 to the eighth power. The number of cells divides until there are only two cells in the outermost panels.

Peterson revealed that he created hundreds more cells but pared them down to his favorite 128 to start “Two to the Eighth Power” with. He marveled how computer science has helped him create so much art in such little time. Peterson can still silkscreen in the traditional way but the digital process requires a lot less time and results in more complex imagery.

“To make prints like these would months and years, if indeed they could be done,” Peterson said. “Now, literally, in three seconds, you can do what might have taken you a full day in the past.”
Geometry in art

Cos Alum David Spellmeyer’s ‘Urban Geometry’ hanging through May 31 in Lawson

David Spellmeyer’s dual major of Computer Science and Chemistry has served him well in his professional and artistic worlds.

The 1983 graduate has worked in the Chemistry field and is now more on the computational side of science as Chief Informatics Officer and Chief Technology Officer at Nodality, a startup biotechnology company developing personalized medicine tools in South San Francisco.

A Richmond, Ind., native now living in Oakland, Calif., Spellmeyer’s passion for black and white photography utilized chemistry concepts in the darkroom and today’s digital cameras and editing techniques require computer science knowledge.

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Spellmeyer, who received an American Chemical Society Fellowship in 2009, has 23 prints now hanging on the third floor of the Lawson Computer Science Building. “Urban Geometry” will be on display through May.

**Question: What is your photographic process?**

**Answer:** I made the transition from chemistry-based to digital-based photography about seven or so years ago. The images for the “Urban Geometry” exhibit were all taken in color with digital SLRs, processed computationally with Adobe Photoshop, and printed on professional inkjet printers.

Currently, my equipment consists of a Nikon D800 with a variety of fixed focal length and zoom lenses, a Mac Pro desktop with 32 Gb of memory, a NEC 30” color calibrated monitor, and an HP Z3200.

**Q: How long have you been a photographer?**

**A:** Photography has always been an avocation for me. It brings me great satisfaction as an artistic outlet. I have been actively involved in photography since my early teens, so quite a while ago. When I was young, my father installed a darkroom in our basement. It was great to have such an immediate feedback to be able to shoot, develop, print all in one day. The transition to a digital workflow affords me that same feedback today.

**Q: When was your first exhibit and where?**

**A:** The 2011-2012 installation of “Urban Geometry” was my first exhibition. (CS manager of Corporate Relations) Jean Jackson had viewed several of my images online. When she started the Alumni Art Project, she invited me to exhibit a series of photographs. What started as a small project blossomed into a full exhibit … .

**Q: What do you look for in “Urban Geometry” shoots? Do you go into the trip knowing what building/landmark you are going to capture?**

**A:** I have a lot of fun searching for visually interesting photographs of common things. Practically speaking, that translates into traveling to large cities around the world that are known for interesting architecture, fountains, sculptures and the like. Once I am there, I search for my photographs in the midst of those elements. Very often, I do have a specific building or landmark in mind when I select the city, but not always. Regardless, I have a lot of fun just walking the city with my camera and tripod searching for other images.

**Q: How has your CS education helped your photographic side, if at all?**

**A:** I think the most significant hurdle in the transition to digital photography is realizing that today’s cameras are basically small computers with a lens. Knowing something about the core technology is a huge advantage. It also helps to have a sense of what the digital manipulation algorithms are doing to the underlying bits and bytes. I am indebted to all the computer scientists who have helped make digital photography a reality and to their continued development.

**Q: What are your thoughts on the Purdue CS department turning 50-years-old this year?**

**A:** It is fantastic. Given how pervasive computer science is, I often find it hard to believe that the first CS department is “only” 50 years old. Our society and our world have changed dramatically from the work of the faculty and students of the Purdue Computer Science Department as we have from Purdue graduates in all disciplines. I am proud to be an alumnus.

**Q: Have you photographed Purdue at all?**

**A:** I have photographs of the Neil Armstrong sculpture and the (Neil) Armstrong building itself is fantastic to shoot. I also have shots of the door on the Michael Golden labs. It’s ancient. I like to wander around campus when I’m back with my camera. It’s a rich environment on its own.
The artist; for more of David Spellmeyer’s photography, go to www.davidspellmeyer.com.
Nobel winner gave Purdue audience preview of new space telescope

Coming up with the Hubble Space Telescope’s successor is no easy task.

There are 18 large beryllium mirrors and a sun shield the size of a tennis court to be installed. Materials must be able to withstand temperatures of 40 Kelvin and an unprecedented rocket that can send the James Webb Space Telescope off onto its 930,000-mile destination must be perfected.

Dr. John Mather, head scientist of the James Webb Space Telescope project and a Nobel Prize winner in Physics, visited Purdue University on Nov. 15 and assured a packed Physics Room 203 that the new ‘scope is steadily progressing as its 2018 launch draws closer.

“If we can do the Mars rover (Curiosity), we can do this,” Mather told the students and faculty gathered.

Mather’s appearance was sponsored by the Department of Physics. He is currently based out of the Goddard Space Flight Center in Maryland, where most of the work on the JWST is being finished.

During his hour-long presentation, Mather showed how the telescope would be much further out into space where it will orbit at least five years, perhaps longer. He expects sharper images and more opportunities to view supernovas, gamma ray burst objects, stars “turning on” and proto-planetary disks. The telescope will help read better measurements of dark energy as well.

“We will get to learn how solar systems evolve,” Mather said.

‘Tech Nation’ taping enlightened CoS students, faculty

Dr. Moira Gunn shoots with worldwide dignitaries on the matter of technology and science every week as host of “Tech Nation,” a weekly Public Radio program.

Over the years, Gunn has interviewed more than 2,000 scientists and other notable figures like Sen. John McCain, Ralph Nader, Dilbert creator Scott Adams, Intel’s Andy Grove, and Larry Page and Sergey Brin of Google.

Gunn has worked computer and technology jobs for NASA as well as IBM, Lockheed-Martin, Rolls-Royce, U.S. Navy and several more. Before her stellar career, Gunn received a Computer Science masters degree from Purdue.

So it was a bit of a homecoming when Gunn brought her show to Purdue campus on Nov. 8 for a live taping in front of about 20 students, staff and faculty. Purdue’s WBAA is a longtime carrier of “Tech Nation,” which airs at 11 a.m. Sundays.