UNIVERSITY OF OREGON
DEPARTMENT OF PHYSICS
1274 University of Oregon
Eugene OR 97403-1274

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Department of Physics
Phone: (541) 346-4751
Fax: (541) 346-5861
kevan@uoregon.edu
Editor: Jim Brau
http://physics.uoregon.edu

Department News

Dietrich Belitz, Dave Soper, and Steven van Enk have been elected Fellows of the American Physical Society. ***Belitz*** was cited for "work on classical and quantal phase transitions," ***Soper*** for "seminal work in Perturbative Quantum Chromodynamics,"and ***Van Enk*** for "pioneering contributions in theoretical quantum information and quantum optics."

David Sokoloff and the Active Learning in Optics & Photonics Team was awarded the 2011 SPIE Educator Award.

Richard Taylor was honored with UO's Thomas F. Herman Faculty Achievement Award for Distinguished Teaching.

Jim Brau will receive UO's 2011 Research Innovation Award for "fostering basic research and innovation in the physical sciences."

Courtney Klosterman was named a 2011-2012 Goldwater Scholar for her senior year at UO.

Hayden McGuinness won in the 2010 Emil Wolf Outstanding Student Paper Competition.

Ellery Ames was recognized as UO's top physics teaching assistant for the AAPT Outstanding Teaching Assistant Award.

Message from the Department Head

A recent survey found just 23% of US high school physics teachers have physics degrees. The need for Grade 6-12 physical science teachers is particularly acute in rural areas and school districts with lower socioeconomic demographics. Most K-12 teachers work within 50 miles of where they grew up. Improving physical science education requires we recruit students broadly to universities with strong physics and teacher preparation programs. Some will return home as physical science teachers.

Led by Senior Instructor Dean Livelybrooks, we are developing outreach and education programs to address these issues. Our NSF-funded GK12 program places graduate students into

classrooms in rural school districts to help install new curriculum and as role models for students who have never met a practicing scientist, much less thought about becoming one themselves. The UCORE program reaches students in community colleges, and the SOS program provides money for scholarships to students from lower socioeconomic backgrounds. Our new Physics Teaching Track is designed to be a 3+1 or 4+1 program, with the final year spent in the School of Education for a practicum and earning a teaching certification. We are proud of Dean's efforts in outreach and education and look forward to the first physics teachers from this effort in 2-3 years.

- Steve Kevan ***kevan@uoregon.edu***

Physics

UNIVERSITY OF OREGON DEPARTMENT OF PHYSICS — SPRING 2011

UO Hosts First Physics Slam

The Eugene community proved again its intense fascination with physics at the Physics Slam, March 22 on the UO campus, the first-ever Physics Slam in the US. A couple hundred physicists were in town for the Linear Collider Workshop, and five of them volunteered to compete with their plain and engaging explanations of topics of choice from particle physics - in only twelve minutes. The "champion" was chosen after all five completed their presentations, by measuring the applause for each of the competitors. Jim Brau served as emcee for the evening. The five contestants came from Europe and the US. An audience of about eight hundred showed up to witness and judge the slam, filling Columbia 150 as well as 123 Pacific.

In his talk titled, "Why physics, dude?" DESY's Marc Wenskat introduced the audience to accelerating cavities. If built, he said, the International Linear Collider would require so many cavities that "ILC can also stand for I Love Cavities". CERN-based, University of Iowa's Garabed Halladjian explained how neutrinos act as astronomical messengers. Argonne National Laboratory's Marcel Demarteau bet the audience that they all had particle detectors in their homes. Had the bet been serious, the local bar would have been tapped out. Smoke detectors, he revealed to surprised attendees, are particle detectors, relying on the same phenomenon, particle ionization, as high energy experiments. SLAC's JoAnne Hewett performed the "dark matter rap," in explaining this mysterious component of the universe.

Slam continued on Page 2

Profile - Steven van Enk

Professor Steven van Enk, who joined our department in 2006, is interested in problems relating to quantum-state entanglement. This is a feature of some states describing two separate systems whose individual quantum states cannot be described independently of the other. Although the concept of entanglement was discussed long ago by Einstein, Podolsky, and Rosen, and also by Schrödinger, it is only recently that it has been recognized as a useful property that can be exploited to create "quantum information technology." The goal of such technology is to create, store, transmit, and process information in ways not possible using classical-physics-based techniques. These include quantum communication techniques such as teleportation and quantum cryptography. These can be implemented using photons or, more generally, entangled states of light. Although it is not hard, in a sense, to create entangled states (for example, just bounce two electrons off each other), it is generally quite hard to verify by only making measurements that entanglement is present. Discovering experimental methods for verifying

Steven van Enk

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van Enk continued

the presence of entanglement, particularly in the field of quantum optics, is one of Steven's interests. He approaches this problem as a theorist, and collaborates with experimentalists such as Jeff Kimble's experimental group at Caltech to test his proposed methods. Using Steven's ideas, Kimble was recently able to verify entanglement between four light beams that shared one photon between them.

Steven, who was promoted to Full Professor in our department in 2009, was born in Veenendaal, in the Netherlands. He lived in Holland until 1993 when he began an odyssey that led him to Eugene. He held postdoctoral positions at the Max-Planck Institute for Quantum Optics, Germany, the University of Innsbruck, Austria, and the California Institute of Technology, where he worked with some of the world's leading theorists in quantum information. He then spent six years as a Member of Technical Staff at Bell Labs, Murray Hill, NJ, before joining the physics department here. He was elected to Fellow of the American Physical Society in 2010. Steven has several hobbies outside of physics. He jokes that he "tries, quite unsuccessfully, to avoid playing chess." He is a Fide Master and places well in the Absolute Correspondence Chess Championship of the USA. He also reports that while at Caltech he was the number one ranked foosball player in the Quantum Optics group.

Slam continued

The audience chose Oxford's Brian Foster as champion for his talk on hidden dimensions. He incorporated his violin, Einstein's tongue, and the history of physics to amuse and inform the audience about string theory. After being awarded the grand prize, which was a copy of "The Physics of Superheros" by James Kakalios, he commented on the enthusiasm and curiosity of the people of Eugene. He concluded that distilling and bottling it would move the ILC to construction the next day.

"It was so great to see hundreds of people of all ages come out for physics, and to see physicists competing over who can explain their topic in the most understandable way," said Kate Hulpke of UO's Materials Science Institute. "Let's do this again and again."

http://www.youtube.com/user/ILCcommunication#p/u

To post alumni news, or to sign up for electronic copies of the newletter, please link to:

http://physics.uoregon.edu/newsletter

Trigger Man - David Strom

Professor David Strom was featured in the Spring 2011 College publication CAScade, in an article by Eric Tucker. http://cascade.uoregon.edu/spring2011/natural-sciences/trigger-man/. Eric writes, "The answer to the ultimate question of life, the universe and, well, everything, — at least at the subatomic level — may soon be at the fingertips of a UO professor."

Strom was elected to serve as deputy trigger coordinator for the ATLAS experiment at the Large Hadron Collider (LHC), the world's largest particle accelerator. Located near Geneva, Switzerland, in a 17-mile-long ring about 500 feet below the earth's surface, the collider is home to several experiments attempting to unravel some of nature's deepest mysteries.

David Strom

David is on sabbatical in Europe working on this vital component of the ATLAS experiment, the trigger. The international collaboration of 2,000 scientists, including a team of UO physicists, seeks to shed light on such scientific enigmas as the origin of mass, extra dimensions of space, black holes and dark matter. The experiment works by smashing together beams of high-energy protons and analyzing the debris. The trigger selects events with potentially interesting interactions from the very large collision event rate (as many as 600 million per second at full power) to arrive at a manageable fraction of the massive amount of data to be recorded. In referring to Strom's heavy responsibility, Jim Brau said "If it is not done well, you can throw the proverbial baby out with the bathwater."

Strom serves as deputy trigger coordinator, and will assume the role of trigger coordinator in late 2011. His election by the ATLAS Collaboration Board, which includes representatives from more than 174 universities and laboratories from 38 countries, including the UO, "is a testament to the esteem in which he is held by his colleagues from around the world," says Stephen Kevan.

The ATLAS detector is massive, stretching about 150 feet long and more than 80 feet high. It is about half as big as the Notre Dame Cathedral in Paris and weighs close to 7,000 tons, the same as the Eiffel Tower or a hundred 747 jets.

As Eric Tucker says in closing his CAScade article, "a textbook-changing discovery could occur at any time. Whether a breakthrough takes place in two years or by the end of the decade, the answers to the ultimate questions have never been so close at hand."

UO's Venerable PDP-7A Finds New Home in Seattle

Harlan Lefevre

The PDP-7A from the UO particle accelerator laboratory now lives in the Living Computer Museum in Seattle. The Living Computer Museum (http://www.pdpplanet.com/), established by Paul Allen, is a showcase for a collection of machines, peripherals, software, and documentation, whose primary focus is on interactive timesharing systems. The museum needed a PDP-7A for the collection, and Harlan Lefevre had one.

The University of Oregon's PDP-7A (S#113) was operated by Harlan Lefevre and his team alongside the UO particle accelerator until his retirement. After the PDP-7 was de-commissioned in 2001 it eventually found its way to Seattle. It was believed to be fully operational after nearly 40 years use with some 65,000 hours logged. Although officially decommissioned it remained in occasional use up until 2006 when it was finally disassembled and shipped into storage at the museum. Recently the machine has undergone restoration including the fitting of new power supplies so it can be regularly seen in operation by visitors to the museum.

Of the four known PDP-7's remaining from the original 99 produced, this machine is the only one fully operational and available to the public.

Societal Practices of Leaf-cutter Ants

Senior research associate Robert Schofield and colleagues have discovered vital societal practices of leaf-cutter ants: when their mandibles wear down and dull, they change assignments, continuing to participate in the family business, but turning the cutting over to younger family members. Robert's work appeared recently in the journal Behavioral Ecology and Sociobiology.

"Cutting leaves is hard work. Much of the cutting is done with a V-shaped blade between teeth on their mandibles that they use like a tailor who holds a pair of scissors in a fixed V shape to slice through cloth," Schofield said. "This blade starts out as sharp as the sharpest razor blade that humans have developed." But the blades don't maintain the required sharpness forever, and eventually dull, slowing the work. At that point the elderly ant moves to the delivery staff, transporting cut materials.

Leaf-cutter Ant

Schofield built an apparatus to measure the force required to cut a leaf with a dissected mandible. Forces of fractions of a newton produced cutting rates of tenths of mm/sec. Schofield is also interested in the composition of the cutting blades. In 2001 he led an accelerator-based study of biomaterials present in mandibular teeth, tarsal claws, stings, and other tools of small organisms. It appears evolution has helped with dull resistant materials: Schofield's work found the cutting blades are composed of highly wear resistant zinc-rich biomaterial. He led the recent work in collaboration with co-authors Kristen D. Emmett, Jack C. Niedbala, and OSU's Michael H. Nesson.

As a member of the LIGO Scientific Collaboration searching for signs of gravitational radiation, Schofield splits his research time between this biophysics work and gravity. He is a frequent and key visitor to the Hanford LIGO Laboratory.

You Can Support UO Physics

Have you wondered how to support UO physics students? It's easy, through the University of Oregon Office of Development. To learn more, go to the physics web page: ***http://physics.uoregon.edu,*** and click on the "Give Now" link.