Deductions of a previously unseen accelerator species—mouse discovery; earning a girl scout badge with an exploration of Fermilab; book review: surprising Nobel Prize stories; a tree-planting community event at SLAC; the stone-faced doorkeepers of building 280; sharing physics research results through e-printing; letters.

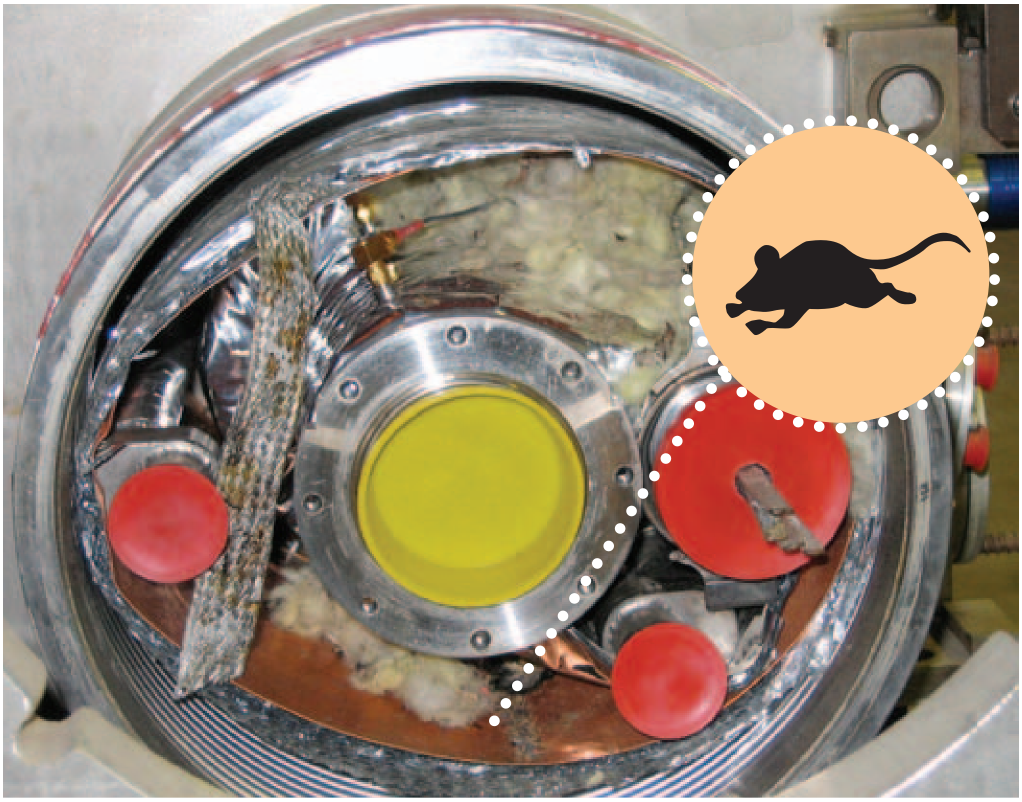


Photo: Jamie Blowers, Fermilab

The Smoking Mouse

Because particle physicists cannot directly see the objects they study, they rely on deduction and decay products to detect nature's tiny, ephemeral particles. At Fermilab, for example, scientists use deduction to discover the presence of quarks, leptons, bosons and mice–as well as, of course, their anti-particles.

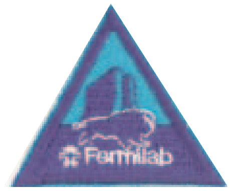
Recently, scientists found evidence for a complex baryonic life form inside a 1200-pound superconducting magnet in Fermilab's Technical Division. Though no one actually saw a mouse, Fermilab Technician Dan Smith uncovered nesting material and bird remnants deep within the "H spool" magnet. According to Smith and other technicians who observed these materials, the nest pieces and chewed bird head contribute direct evidence for the existence of a mouse. However, scientists are still trying to figure out how the mouse got in.

"On the outside of the magnet, there's a stainless steel box," said Smith. "You have to grind off the weld joints to get inside, and there are a good couple miles of welds—literally. Inside there's liquid helium, and then an insulating vacuum. And that's where we found the nest and bird head, which we still have."

Because many types of particles occur only rarely in collisions, it often takes years for physicists to detect new forms of matter. "In the 30 years I've been here," said Smith, "I've never, ever seen something like this."

As for the anti-matter of the mouse, it's actually easier to find than the real matter version. In an unofficial survey, a wide majority of human participants were found to be anti-mice.

Lisa Zyga



A Badge of Honor and Buffalo

Fermilab's new Girl Scout badge has troop #312 excited about "atoms and buffalo." Unlike a field trip where kids visit Fermilab to learn about physics in an "educational environment," the Girl Scouts' Fermilab outing lets kids come with their friends and a scout leader to explore the particles and the prairie through their own eyes.

"We have a big book that we look at to find out what we need to do to get a badge," said Kelsey, one of the 10 members of the troop. Their ages range from 10 to 13, plus 5-year-old Maddie. To earn the Fermilab badge, the scouts had to pick seeds in the prairie and talk to various people, including an architect. "We learned about how the atoms work and how the pipes [accelerators] work," Liana explained.

The girls agreed that the Fermilab badge ranks right up there with badges they got for horse riding and cooking. "The badge reminds you of your experience," said Kelsey, "and how hard you worked for it. It's a big accomplishment."

Tiffany liked the badge, too. "It makes me think of funny memories about buffalo," she said, adding that the buffalo experience was "too personal" to share.

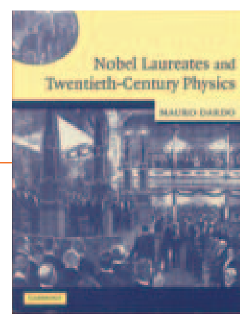
The scouts thought the badge design did a good job of representing Fermilab. "The buffalo is a big part of Fermilab," Susie explained. However, the scouts also had a few ideas of their own: Tiffany proposed a "frog badge," Liana an "astronomy badge," Amanda a "pyramid of girl scouts," and Taylor a badge with 99 bottles of pop and a little microphone which would constantly sing their favorite song throughout the whole trip.

Lisa Zyga

Reviewed by Elizabeth Clements

Nobel Laureates and Twentieth-Century Physics

Mauro Dardo
Cambridge University Press, Cambridge, 2004



Do you know why Louis Victor de Broglie won a Nobel Prize in 1929? Or why a Nobel Prize wasn't given out in 1934? What about Nils Gustaf Dalen's invention of an automatic sun valve beating out Max Planck and Albert Einstein for the Nobel Prize in 1912?

In *Nobel Laureates and Twentieth-Century Physics*, Mauro Dardo, a professor of experimental physics at Amedeo Avogadro University of Eastern Piedmont in Novara, Italy, goes beyond answering these questions and highlights the greatest achievements of 20th century physics. Focusing on the individual stories of each Nobel Prize winner, Dardo uses a unique approach and tells the story of modern physics in a year-by-year format. Starting with Copernicus, the first thirty pages of the book lay out the foundation for modern physics and outline the origins of the Nobel Prize. From relativity to quantum mechanics to superconductivity, Dardo uses simple language to explain the accomplishments of modern physics, and he attempts to decipher some of the more complicated theories of the past century. Written for the lay reader but also of interest to scientists, *Nobel Laureates and Twentieth-Century Physics* will appeal to history buffs and physics enthusiasts. It's also the perfect text for a history of science course.

Now, as for our opening questions: Louis Victor de Broglie won the Nobel Prize in 1929 for his discovery of the wave nature of electrons. Yet just two years earlier, in 1927, the Nobel Physics Committee had not considered quantum mechanics worthy of a prize because it had not yet led to any experimental discovery of importance.

Even though the 1934 list of Nobel Prize candidates included Max Born and Wolfgang Pauli, the Nobel Prize Committee found no candidate worthy of the prize and decided to reserve it for the following year. The Academy eventually deposited the 1934 prize money in a special fund for Swedish research.

And Nils Gustaf Dalen beat out Max Planck and Albert Einstein for the 1912 Nobel Prize because members of the Academy representing the field of technology felt the awards had become too academic.

Photo: Joni White, SLAC

Good Natured Community Relations

Working at Stanford Linear Accelerator Center, you never know what projects may come your way. So when Helen Quinn, head of education outreach at SLAC, asked me to plant trees with a class of fourth graders, I said sure, it's not rocket science. Our goal was to plant the trees before January 1 to allow for enough rainfall for the trees to survive. We also had to protect the young plants from the deer that wander SLAC's grounds. Though I was a tree-planting novice, I thought this sounded like a good chance to connect with a local school and add some new oaks to SLAC's already magnificent collection.

The class gathered acorns from their neighborhoods and sprouted them into saplings. The children, many prepared with trowels and gloves, walked over from their nearby school, carefully carrying a dozen small trees growing in milk cartons. The volunteer team at SLAC was waiting in the meadow adjacent to the front gate, ready to assist.

The class paired off and walked out into the meadow where we showed them where to plant the saplings. Vicente Gomez from SLAC's landscaping staff supplied a few shovels and the kids began digging. They were excited to learn they could jump on the shovel and really move some ground! Seeing that, and the satisfaction of having planted a new meadow full of oak trees, we all enjoyed the time outside away from our desks and agreed that this sort of outreach is especially worthwhile.

Joni White, SLAC

The growth of e-printing

Before the days of the World Wide Web, scientists would mail their colleagues preprints, hard copies of papers submitted to scientific journals. In 1991, particle physicists began posting these papers on the Web, calling them e-prints. Today, the e-print archive at arXiv.org includes archives of all fields of physics.

In the accompanying chart, comparing the number of e-print submissions since 1991 with the submissions made in 2004 gives an indication of the pace at which e-printing was adopted by fields related to particle and high-energy physics.

Scientists in lattice gauge theory (hep-lat), among the first to use an e-print archive, had already posted half their preprints (by 2004 standards) in 1992. Lattice gauge theory is a relatively small community of highly computer-literate researchers with a strong tradition of collaboration. By 1996, the lattice community had posted 90% of its annual number of preprints on the e-print archive, using the 2004 submission numbers as comparison.

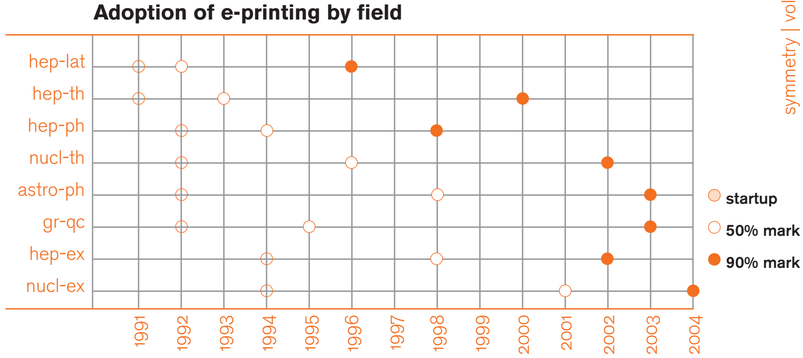
The earlier a field has reached the 90% point, the more likely the field has reached full adoption. Fields that have reached the 90% mark rather late have been either slow at adopting e-printing or have experienced strong growth in the number of e-prints produced in recent years. These latter fields include astrophysics (astro-ph), general relativity and quantum cosmology (gr-qc), and nuclear experiments (nucl-ex).

The widely-practiced field of general relativity and quantum cosmology, with scientists distributed around the world, has the longest time span (8 years) between reaching the 50% and the 90% marks. Adoption of e-printing may have been slow in some of the contributing countries. In fact, only 21% of gr-qc papers in 2004 had an author based in the United States, the smallest percentage of any archive.

Heath O'Connell, Fermilab

Source: SPIRES

Adoption of e-printing by field



Photos: Diana Rogers, SLAC

The doorkeepers of building 280

Unless you're looking for them, you might not notice the two stone gargoyles standing watch over building 280 at Stanford Linear Accelerator Center. In fact, for the first month they were in place, not many people did notice them.

They are easy to miss. The building's architecture, dominated by corrugated metal siding and right angles, makes the rooftop an unlikely place to find these stoic granite sentries. It is, after all, about the farthest from gothic style imaginable.

But Tom Himel, who had a hand in assigning the guards to their post in 1996, disagrees. "This building absolutely cries out for gargoyles," he says. Iron girders along the outside walls, retrofitted to enhance earthquake safety, reminded Himel and co-conspirator Bruce Feerick of flying buttresses. "If you have flying buttresses, you have to have gargoyles," he says.

Himel procured the gargoyles from a mail order catalog, and Feerick machined a pair of base plates to anchor them in position. Under cover of early morning, Himel and Feerick furtively clambered up to the roof and fastened the statues in place. Since most of building 280's occupants hadn't yet arrived, Himel and Feerick were confident their secret was safe.

But Tonya Boysen, the building supervisor at the time, noticed the addition right away. Her main concern? Himel says, "she wanted to know if they were an earthquake hazard."

Matthew Early Wright

Letters

Muons, gluons, futons

When my wife is intrigued by the cover of a particle physics magazine, as she was with the February issue of *symmetry*, you know your editors and designers are doing a good job.

In regard to John Womersley's article, "Beyond the Standard Model," let me suggest that physicists might find some of the missing matter in the cobwebs and dust bunnies that mysteriously appear in my office. I've also pondered the whereabouts of thoughts that fly out of my head, and perhaps the next Einstein can explain where they go. Finally, in addition to muons, gluons, futons and the like, might I suggest you look for the do-over, which would be a handy particle to have.

Bill Dietrich, Anacortes, WA

Teaching art with physics

I teach physics to college art students at the School of the Art Institute of Chicago. You have published three issues of *symmetry*, and each time I've found something in it to point out to my students. From the first issue, the article "Extreme Neutrinos" was used by a student last semester for a paper he wrote. A current student, interested in how science influences art, was intrigued by the paintings of Dawn Meson reproduced in the second issue. And, finally, in an ongoing effort to show my students what science is really like, I'm having current students scan the "Quantum Diaries" blogs that were mentioned in the third issue. They are to look for something in a scientist's day that they find unexpected or surprising. I'm sure it will be interesting to see what they bring in.

It's really very nice to have a magazine that deals with contemporary events in science be appealing and accessible to the non-scientist. I'm sure I'll make more use of the past issues, and I'm looking forward to taking future ones to my students as well.

Lastly, I told my husband (a condensed matter physicist) that the high-energy physicists are way ahead of them in terms of demystifying the career. The CM physicists had better watch out or all the young people will want to study HEP!

Elizabeth Freeland, Chicago, IL

Letters can be submitted via letters@symmetrymagazine.org