The roof that would not seal; Fermilab's fluttering comma; nature's particle bounty; the no-muss, no-fuss instant computing center; BaBar's six minutes of fame; nightclub physics; particle contest winners.

Photo: Reidar Hahn, Fermilab

From rivets to ribbits

An impromptu frog habitat vanished with final repairs to the roof of Fermilab's Meson Lab.

Leaks—lots of leaks—have plagued the lab's 12 blue and orange concave arches since it opened 32 years ago. The building was created as a striking aesthetic element of the Fermilab landscape, but the nearly 44,000 rivet holes provided 44,000 possible places for water to find a way inside.

"This roof is notorious. It has challenged every director the lab has had," says Erik Ramberg, head of the Meson test facility. "We'll see if this one triumphs."

The leaks forced scientists to move equipment, build indoor roofs four layers thick to protect machinery, and even shut down parts of experiments.

Amphibians, meanwhile, were in heaven.

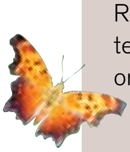
Ramberg says that in his five years working in the lab, he often heard croaking. "I saw a snake in there yesterday," he says. "It has to be eating something."

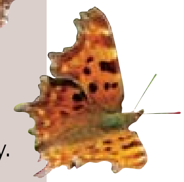
Workers recently took to the roof to patch holes in the steel and fill in cavities. Then they applied an elastomeric coating that hardened in the sunlight to form a flexible sheet. Finally, they restored the building's original blue and orange colors.

Ramberg says he'll miss the building's quirks, such as the rain that would fall indoors the day after a snowfall. But he hopes the repairs stick, for both safety and financial reasons.

The building will soon become home to R&D projects for the proposed International Linear Collider. "This is a big milestone for us, because that facility will become a showcase for the laboratory over the next few years," says Randy Ortgiesen, head of the lab's Facilities Engineering Services Section. "We'll have dignitaries coming from all over to tour it."

Rhianna Wisniewski





Butterfly researchers come to Fermilab for rare species

Scientists usually search Fermilab for exotic particles, but two Alabama researchers recently sought another rarity—a butterfly called the Gray Comma.

The woodland butterfly with the comma-shaped marking under its wing was one of the last 10 butterfly species Paulette Haywood and Sara Bright needed to complete a book about the 125 butterfly species of the Southeastern United States. The pair has worked on the book for 12 years.

"The Gray Comma would have been difficult to find and document in the Southeast," says Haywood. "So for us to be able to come to Fermilab and knock another species off our list was huge."

The researchers were drawn to the laboratory by a Web site, run by Technical Division engineer Tom Peterson, that documents Fermilab's natural setting and its butterfly population.

Peterson, who has watched butterflies at Fermilab for 31 years, was happy to point out the butterfly's habitat on the west side of the laboratory. "We've been careful, in our management of the land here at Fermilab, to restore it in a way that's friendly to nature," he says. "And certainly that's reflected in the variety of butterflies, birds, and plants we find here."

Haywood and Bright hope their book will help people understand how interconnected nature is and the importance of taking care of the environment. "People love to look at beautiful butterflies," Haywood says. "But they have to understand that to see those beautiful butterflies, there have to be places like Fermilab for them to live and thrive."

Amelia Williamson

Particles in the sky

What is the universe made of? What are matter, energy, space, and time? How did we get here and where are we going?

In particle physics, the classic place to look for answers is in giant accelerators where particles collide.

But nature also provides a wealth of data, in the form of neutrinos streaming from the sun and other stars, the faint afterglow of radiation from the big bang, and other space phenomena. Particle physicists increasingly turn to these non-traditional sources of information and collaborate with colleagues in astrophysics and cosmology to get a more complete view.

That collaboration is reflected in the SPIRES database of publications in high-energy physics. Starting in the 1980s, large numbers of particle physicists began citing articles related to the sky. For much of that decade, two publications on the theory of inflation, the super-fast expansion of the early universe, ranked among the 50 most-cited papers in SPIRES.

By the late 1980s, neutrino data gleaned by observing the sky became a hot commodity. Interest was spurred by the first recordings of neutrinos emitted by a supernova, or exploding star, obtained by the Kamiokande-II and Irvine-Michigan-Brookhaven experiments. A few years later, particle physicists eagerly absorbed results from the Cosmic Background Observer, a satellite that mapped the afterglow of the big bang; the announcement of those results was the second-most-cited publication in the SPIRES database for 1993.

The last ten years have seen a flood of non-traditional papers on the SPIRES top-cited lists (see www.slac.stanford.edu/spires/topcites/matrix.shtml). They include the discovery of oscillations of atmospheric neutrinos, evidence for an accelerating universe, and the puzzling deficit of certain types of neutrinos from the sun. Together, the contributions from all of these fields bring us closer to understanding the mysteries of the universe.

Heath O'Connell

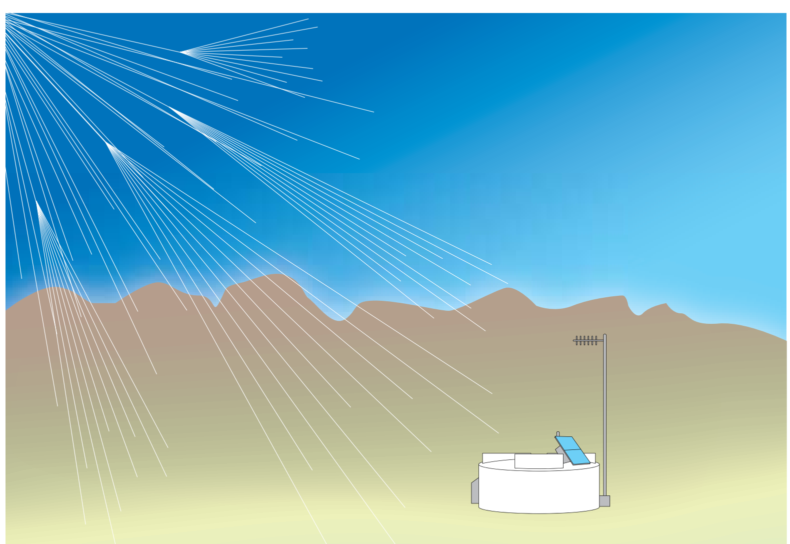


Illustration: Sandbox Studio

Photo: John Weisskopf, SLAC

Computing center in a box

Stanford Linear Accelerator Center's newest computing center arrived in a standard 20-foot-long shipping container.

But nobody had to worry about pulling a muscle unpacking it. A crane lifted the 23,340 pound container off a flatbed truck and carefully placed it on a concrete pad behind the computing building.

Once hooked up to power, cooling water, and networking cables, it became a self-contained data center with 252 servers, expanding the lab's scientific computing capacity by one-third.

SLAC is the first customer to test Sun Microsystems' self-contained computer center, known as Project Blackbox. Randy Melen, leader of the lab's high-performance storage and computing team, says it was the answer to the question, "How do you extend your data center without too much pain?"

Doors at each end of the insulated shipping container open onto a center aisle that looks like a hall of mirrors, lined with shiny silver panels. Racks of computing equipment are hidden behind the panels and can be pulled out into the aisle for maintenance.

One thing: SLAC's Blackbox is not black. It was painted white, to stay cooler in the California sun.

Heather Rock Woods

BaBar is a video star

Search for "BaBar" on YouTube.com, and you'll get a long list of links to a 1980s TV series based on an animated elephant. But a surprise is hidden among the cartoons—a six-minute film shot in the Stanford Linear Accelerator Center's BaBar control room.

The film was created by University of Tennessee graduate student Bradley Wogsland, who spent a year at the lab working with BaBar—a detector that records what happens when electrons and positrons collide.

Wogsland started taping comedy sketches as a kid and has posted nearly 400 videos on YouTube. *Being a SLACer* alternates shots of his family, the lab, and cultural references, including scenes from *Lord of the Rings*. He's posted films of the SLAC library, deer lounging in the parking lot, and a colleague talking about a string of bicycle mishaps, titled *Physicists Shouldn't Ride Bikes*.

Earlier this year he spent a shift operating BaBar and turned the camera on himself.

"I thought a lot of people would be interested to see how the control room works," says Wogsland. "As a kid, I had no idea what went on inside a control room to take the data, and I wanted to know."

The video pans around the room, showing various control screens and the data they contain: luminosity, instrumental flux return, the alarm handler. A voice comes over the intercom and says, "Attention: Automatic end run sequences activated."

The video has garnered more than a thousand hits and a mixed bag of comments.

"Nice, we need more videos like this," says one viewer.

"What the heck is a BaBar? In words I can understand," says another. "R u making electricity?"

A third chimes in, "It really is like *Star Trek* in there."

After launching a farewell video—a seven-second shot of his SLAC hard hat, with the theme song from *The Good, the Bad and the Ugly* playing in the background—Wogsland returned to Tennessee. But he has not hung up his camera.

"I'm creating lab demos for a physics class that I'm teaching this fall," he says, "and posting them on YouTube so students can see equipment in use before they have to use it in the lab. The potential of this emerging medium is enormous."

The control room video can be viewed at http://youtube.com/watch?v=dj7gCZTEoqo.

Ken Kingery

Editor's note: We are collecting online videos related to particle physics to share with our readers. Please let us know your favorites at letters@symmetrymagazine.org.

Image courtesy of Rika Takahashi, ILC GDE

A night of wonder

Men and women wearing gaudy dresses, looking for customers under garish neon signs—this is a common sight in Kabuki-cho, Shinjuku, a famous entertainment and red-light district in Tokyo, Japan. Walking down an alley past bars and nightclubs, you will see a hand-written sign posted on a shabby building: "The Accelerator's Night 3."

This sleepless town is home to the "Accelerator's Night," a science seminar produced by Kenichi Kojima, who organizes group tours to such places as laboratories, factories, and historic places. His program is called "Shakai-ka Kengaku ni Ikou!" (Translation: Let's go on a field trip!). More than 7000 people have registered online, creating a unique field-trip club for adults only.

What's a science seminar doing in the red-light district? It started with a traffic jam.

For two years, Kojima has been organizing field trips to KEK, the international particle physics center in Tsukuba. On one of those excursions the bus got stuck in traffic. One of the tour guides, Satoru Yamashita of the International Center for Elementary Particle Physics at the University of Tokyo, killed time by talking about accelerator science, particle physics, and the International Linear Collider project for two full hours. "People on the bus enjoyed his talk very much, so I proposed that Dr. Yamashita have a seminar with his colleagues," Kojima says. He arranged to hold the the first "Accelerator's Night" at a Kabuki-cho nightclub owned by a friend.

Yamashita says he was skeptical that the seminar would find an audience, but "surprisingly, the place was packed. They are not only interested in the science but also fascinated by the machine itself. That really opened my eyes." Novelist Aya Kaida was one of the seminar moderators. "The accelerators are such beautiful machines. I don't think scientists are aware of that very much," she says. "It is a shame to not show these beauties to more and more people."

For one recent seminar the basement nightclub was crowded with about 70 attendees, some with physics backgrounds but most with no connection to the field. There were many women in the room—unusual for a physics talk in Japan. Three experts, including Yamashita, spoke about radiation physics, particle physics basics, and how an accelerator works. "People gathering here are very active in so many ways. It is very important for us to introduce our efforts to people like them," says Junpei Fujimoto, a KEK scientist and seminar speaker. "A new project like the ILC especially needs more attention and understanding from the general public. Hopefully, we can have seminars like this regularly in different cities."

Yamashita thinks the seminars also give scientists valuable practice in talking with the public. "We are learning so much from the audiences, such as where their interests lie and how we should attempt to gain more understanding," he says.

Following a brisk question-and-answer session, the seminar finally ended more than an hour late, and the scientists set off running toward Shinjuku station to catch the last train home.

Rika Takahashi, ILC Global Design Effort

Letters can be submitted via letters@symmetrymagazine.org

RESULTS!
The particles of our readers' imaginations

We asked you to use Roz Chast's cover of the May issue of *symmetry* as inspiration to go beyond the elementary particles already discovered or theorized and tell us about the particles of your dreams. The dozens of responses were clever, funny, and insightful.

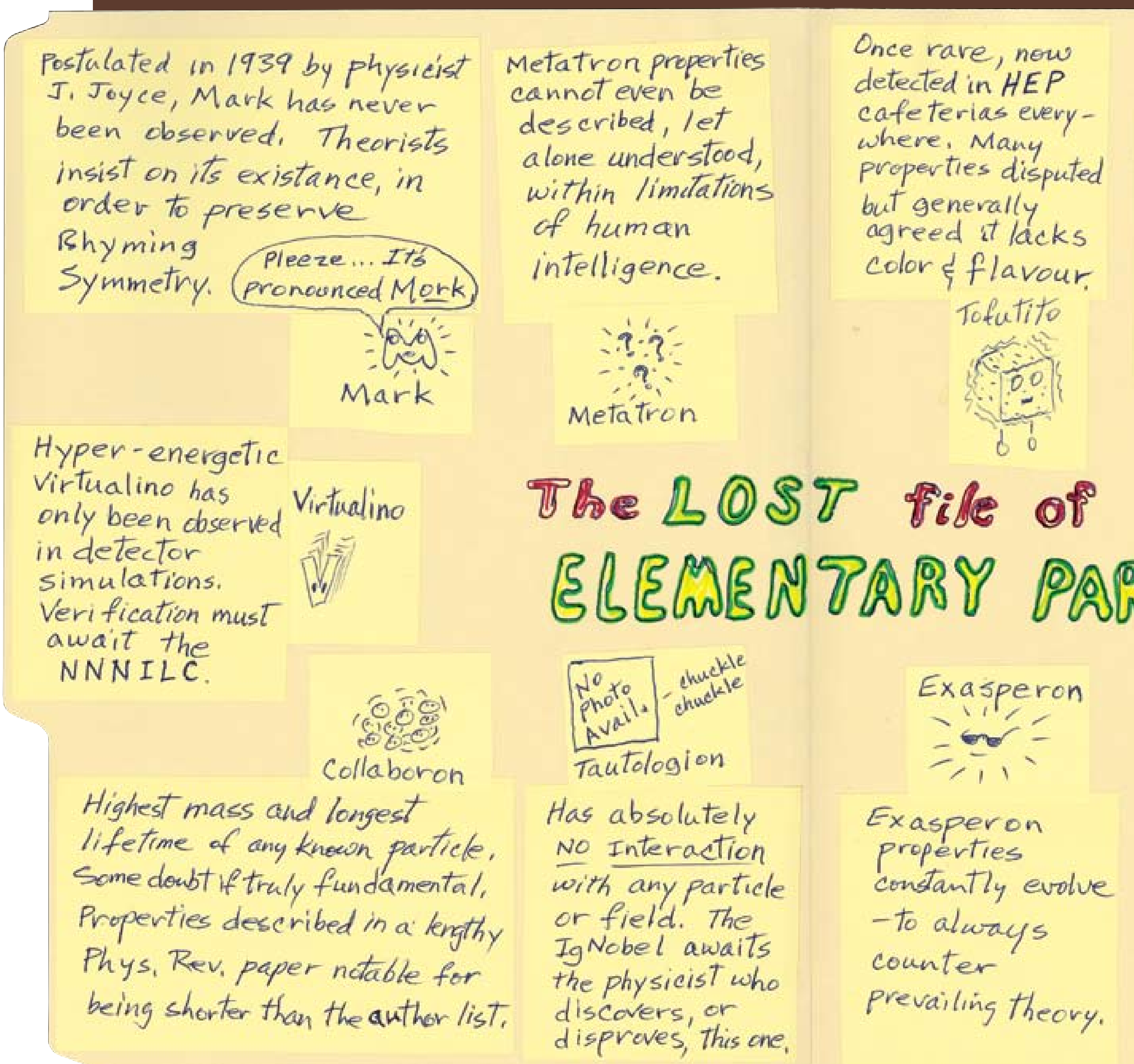
It was difficult to choose a few entries to highlight. Those that stood out most made us laugh or think, and sometimes both.

1st place

The Lost File of Elementary Particles

Chuck Yoneda from Stanford Linear Accelerator Center entered *The Lost File of Elementary Particles,* which mixed scientific principles with humor, winning him first place and an autographed copy of Roz Chast's cover for the May 2007 issue of *symmetry*. Runners-up received posters of the Chast cover.

Chuck Yoneda, SLAC



2nd place

Leapton

A particle created anytime someone jumps on the bandwagon in support of an elegant but unprovable theory.

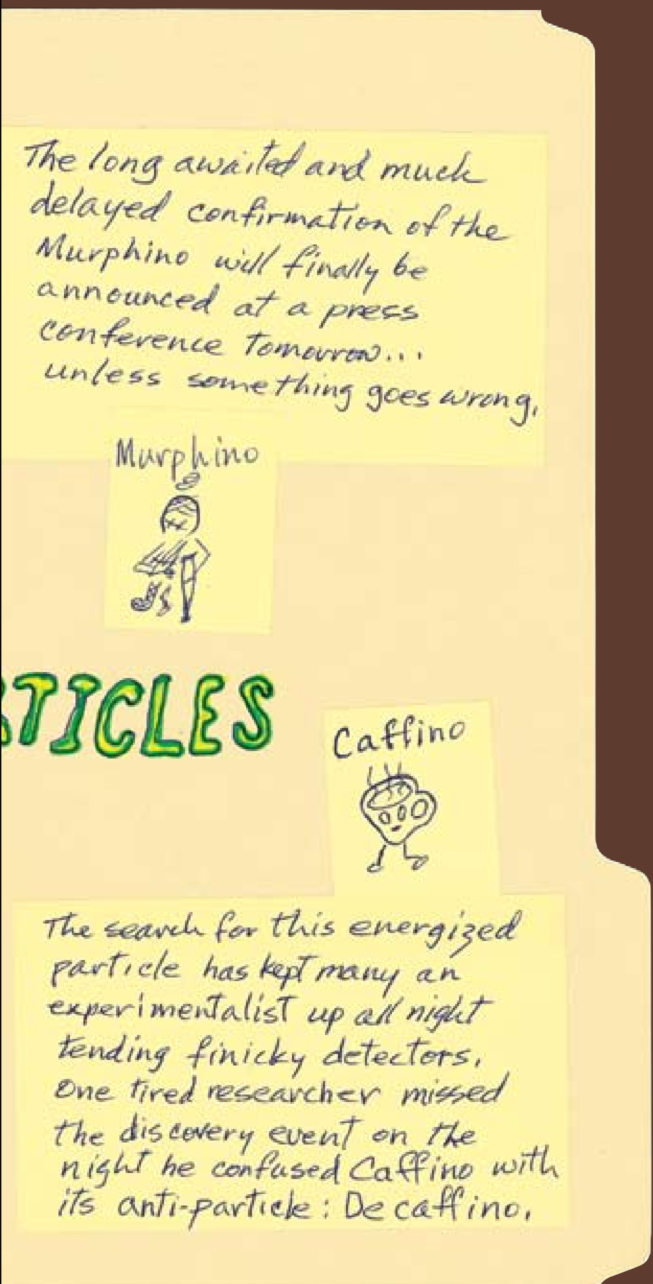
Julie Phillips (text) and Greg Kuebler (illustration), JILA, Boulder, Colorado

3rd place

Blogino

Particles created by non-abelian Blog-Blog interactions. Bloginos typically are produced in a very excited state and with a high degree of spin. Even though all their properties have not yet been determined, it is commonly agreed that they exhibit considerable truthiness. They also have the annoying ability to propagate into extra dimensions, away from the blogosphere, and generate lots of phone calls.

Jacobo Konigsberg, Fermilab



Runners up

Rockon

Responsible for such things as face-melting guitar solos, heart-pumping rhythms, screaming vocals, and hair bands. Observation of the rockon over the airwaves has been on the decline since 1995.

Ike Hall, Fermilab

Oreo

When near a small child, the Oreo undergoes spontaneous fission, revealing a creamy center. Note: The center always ends up on one side, illustrating the principle of symmetry violation.

John T. Collier, Winfield, Illinois

Velcron

Holds together all the seemingly huge particles formed in high-energy collisions at the Tevatron. Since the lifetimes of these particles are so short, it must be the velcron that holds the pieces together until they run into a stronger force, at which time they detach. Comes in two species, the loop velcron and the hook velcron.

Paul C. Czarapata, Fermilab

Postiton

Carrier of the ultraweak force, the postiton was invented for those jobs for which the gluon is just too sticky. It comes in stacks, just like D-branes in string theory.

Lance Dixon, SLAC