signal to background

Shooting down UFO rumors; growing a physics family tree; driving an eco-trend; feeling a mine's deep, earthy vibes; baby detector on board; quake-shaken lab reaches out to neighbors.

Illustration: Sandbox Studio

Nope, no UFOs at Brookhaven Lab

The spotlight caught Todd Satogata. The camera zoomed in.

"Did your particle beam shoot down a UFO?" the TV host asked.

The accelerator physicist at RHIC, Brookhaven National Laboratory's Relativistic Heavy Ion Collider, smiled.

Of course not.

With a friendly countenance and confident tone, Satogata kept steering the dialogue back to physics concepts and giving the hosts of *UFO Hunters*, a weekly series on the History Channel, a reality check on their extraordinary claims.

Each week, UFO hunters Bill Birnes, Kevin Cook, and Pat Uskert travel to the sites of purported alien encounters. They visited Brookhaven in April to probe an alleged UFO crash Nov. 24, 1992, in South Haven Park, about five miles from the lab. UFO buffs tell of the lab's fire department responding to the crash and extinguishing massive brush fires.

Brookhaven lab Fire Chief Chuck La Salla showed the film crew a logbook entry for that evening, which noted nothing out of the ordinary and no off-site response by firefighters.

Later versions of the tale claim that firefighters brought parts of the wreck back to the lab, where scientists analyzed alien tissue. They even have the laboratory's Alternating Gradient Synchrotron, which injects particles into RHIC, shooting down the spacecraft with a high-power plasma beam.

But the sci-fi-like sniper attack couldn't have occurred. The beams that circulate in RHIC and other particle accelerators are confined to a prescribed path. Even if they did escape, they would dissipate as soon as they interacted with air.

With its history of operating research reactors and particle accelerators, Brookhaven has long been a focus of UFO fans; a Google search of the two brings up 4620 postings. Brookhaven scientists hope that if they show UFO buffs what the laboratory really does, alien tales will carry less weight.

During the TV crew's visit, RHIC was delivering protons to the STAR and PHENIX detectors. Satogata, interviewed in the main control room, found time during tape changes and sound checks to teach the crew about the science going on in the background.

"It'll be interesting to see how it's edited and how it turns out," Satogata said after the crew wrapped up.

Mona Rowe

Detectors shipped in cooking pots

Looking for an inexpensive and safe way to transport delicate particle detectors? Try pressure cookers and child safety seats.

When researchers at the Max Planck Institute for Physics in Munich drive fragile germanium crystals across Europe, they resort to conventional household equipment to keep the crystals safe.

The fist-size crystals have to remain under clean-room conditions to keep their particle detection prowess. Pressure cookers, normally used to cook food and steam vegetables, are the perfect solution. The MPI Mechanics Division has outfitted seven pots with connectors and pressure gauges. After placing the crystals in the pots, researchers pump the air out of the pressure cookers to protect the crystals from contaminants. The team then straps the pots into child safety seats, creating a low-tech solution for the transportation of high-tech equipment.

The crystals, produced at Canberra France, are prototype detectors developed for the Germanium Detector Array, or GERDA. Located deep underground in the Gran Sasso mountains in Italy, GERDA will search for the existence of the nuclear process known as neutrinoless double beta decay to gain more information on neutrinos, elusive particles produced in the center of the sun. Scientists want to determine the masses of neutrinos and find out whether neutrinos are their own antiparticles.

The first crystals have already made the trip from Strasbourg to Munich, a distance of about 400 kilometers. Later they will travel to the Gran Sasso National Laboratory. Fortunately, border controls have disappeared in most of Europe. Imagine how difficult it would have been to explain to officers the transport of these precious GERDA "babies." Just in case, the drivers carry with them documents to prove that the pressure cookers are tested transport containers.

Silke Zollinger

Photos: Max-Planck-Institut für Physik, Munich

Photo courtesy of James Volk

The DUSEL cavern is getting restless

You can't feel it. Yet the moon's gravitational pull shifts the ground ever so slightly, creating "earth tides" that rhythmically raise and lower the ground.

That's enough to throw off delicate scientific equipment, such as the systems used to aim two hair's-width particle beams into a head-on collision.

And that's not the only slow, subtle movement going on. At Fermilab, for instance, the spring thaw shifts the magnets that focus particle beams. So the lab developed sensors that track ground tilt to within 1/14th the diameter of a hair over a distance of 30 feet, allowing them to correct for the motion at one-tenth the previous cost.

Now those sensors are offering a new way to cheaply monitor the effects of sucking seven megatons of water out of granite caverns that will house the world's deepest underground lab.

In January, Fermilab physicist Jim Volk (photo, right) helped Larry Stetler (left), a geological engineer from the South Dakota School of Mines & Technology, and a few graduate students install 12 of the ground sensors at the 2000-foot level of Homestake Mine, proposed future home of DUSEL.

They lugged cables, wires and water lines through puddles of muck in 75-degree heat with 95 percent humidity. More sensors will go in at the 4100-foot level this summer and at the 4850-foot level later this year.

"It was hot and dirty," Volk says. "That brown iron ore dust, it gets in everywhere."

After the South Dakota gold mine closed in 2001, the pumps were turned off and groundwater submerged half of its 8000-foot depth.

As that water is pumped back out, the ground shifts. Monitoring those movements, as well as earth tides and shifts in the rock triggered by excavation, will be key to calibrating research equipment.

"It is not pure high-energy physics, but it is useful science," Volk says of his work in the mine. "We are helping those guys get data and understand what is going on with the rock."

As a bonus, he says, he's learning a lot of geology that will come in handy for other projects. Despite the discomforts of working deep underground, "I can't wait to get back there."

Tona Kunz

It's cute! It's clean! It's a SLACmobile!

Plugged into a weatherproof outlet behind SLAC's Test Laboratory, what looks like an oversized green-and-silver go-cart waits with its load of tools and paint supplies. It's part of a fleet of pint-sized economobiles that have carried people, materials, and equipment around SLAC National Accelerator Laboratory since the lab's early days.

It all started with trikes. "The linac was full of three-wheeled bicycles way back when," says SLAC fleet services garage supervisor Al Manuel. In the mid-60s, he says, SLACers pedaled tricycles up and down the Klystron Gallery that serves the lab's two-mile linear accelerator.

Over time the trikes gave way to three-wheeled Cushman carts, former US Post Office vehicles powered by gasoline. By the early 1980s, electric four-wheelers began to appear. More than 50 of those jaunty flatbeds and microvans, some painted orange, red, or purple, carry ladders, mail, or library books across the site and around the mile-long PEP Ring Road. Manuel's group keeps them running, alongside the mopeds and low-speed gas vehicles that have since joined the fleet.

For some of the older vehicles "a lot of repair parts are not available any more," says SLAC Transportation Manager Ken Rubino, so workers salvage parts from others that are beyond repair.

As SLACmobiles go out of service, the fleet changes composition. At one time, Rubino says, scores of mopeds zipped around SLAC. Now the balance has shifted in favor of small-appetite gas vehicles and electric carts. The fleet's users treat their wheels with some affection. One cart's cab sports a pair of bull's horns. Volunteers spruced up a second with removable flame stickers and a set of fuzzy dice for founding SLAC Director Pief Panofsky, who died in 2007.

"Pief loved it," says Ellie Lwin, Panofsky's assistant at the time, who spearheaded creation of the Piefmobile—even paying for the materials herself—as a surprise for him.

SLAC's 15 gas-powered mini-pickups and vans get up to 50 miles to the gallon, thanks to their three-cylinder engines and light weight. But most of today's fleet runs on electricity. If the United States plays its cards right with solar and wind power, more SLACmobiles could run on sunshine and fresh air in the years to come.

Shawne Workman

Photos: Brad Plummer, SLAC

Photo-illustration: Sandbox Studio

This family tree has physics branches

Who is the grandfather of particle physics? Some might argue he is Otto Mencke, a German philosopher and scientist who received his doctorate from Leipzig University in 1688.

In the SPIRES HEPNAMES database, Mencke has the largest number of traceable academic descendents in the field. His 1228 physicist descendents include 30 at Fermilab, 20 at SLAC, and 19 at Brookhaven National Laboratory.

The worldwide directory of names allows particle physicists and astrophysicists to trace their scientific genealogies in much the same way that people track their family trees. In

this case, each senior scientist trains successive waves of graduate students and postdocs, who become siblings of sorts as they work together and go on to train descendents of their own.

John Beacom, a physics professor at Ohio State University, says looking at a colleague's scientific relatives is helpful in understanding his or her school of thought. "There is some family resemblance," he says. "It's really about understanding the context of who someone is."

HEPNAMES is part of the SPIRES service, which is jointly operated by DESY, Fermilab, and SLAC. HEPNAMES itself is managed by Fermilab. It gets about 2000 hits per day, mostly from people combing through its 80,000 individual monikers to find current contact information for colleagues, says Heath O'Connell, Fermilab's head of information services.

Enrico Fermi has 27 Fermilab physicists in his family tree, including Winslow Baker, Norman Gelfand, King-Yuen Ng, Jim Strait, and Gong Ping Yeh. Ten Fermilab physicists had Nobel Prize winners as advisors. Jim Strait, project manager for US participation in the Large Hadron Collider, has three Nobel Prize winners in his physics family.

Beacom primarily uses the database to get background on students. "When I'm trying to judge letters of reference, and professors say a student was their best student, I can look up their other students," says Beacom. HEPNAMES also can help prevent bias in peer review: Beacom makes sure he doesn't send students' papers to their advisors for review, and vice-versa.

Beacom has been using HEPNAMES regularly since SLAC started it in the early 1980s. "It's interesting and fun just to understand how long and how slow the scientific process is," he says. "What we are doing today resembles what scientists were doing hundreds of years ago."

Kristine Crane

Photo: Francesco Arneodo, LNGS-INFN

Unharmed in quake, Gran Sasso lab goes to the rescue

When an earthquake flattened buildings in a number of towns across central Italy, physicists turned their focus from research to rescue and rebuilding.

The 6.3-magnitude earthquake on April 14, 2009, killed more than 300 people and left towns near Gran Sasso National Laboratory, a particle physics research center studying neutrinos and dark matter, nearly obliterated. With the laboratory itself mostly unscathed, scientists and engineers rushed to the aid of villagers and the physics department of L' Aquila University.

A laboratory building was quickly converted into a guest house for employees and users who had lost their homes, and space was made to relocate the physics department on-site. With the village of Assergi in rubble, the laboratory offered to shelter the villagers' tent city inside its boundaries. When villagers chose instead to stay close to their damaged homes, the laboratory came to them. Chairs, tables, and just about anything moveable that could improve life in the camps was toted to the nearby village. Lab Director Eugenio Coccia and other staff visited the camp regularly to offer a lifeline of aid and support.

Physicist Roberto Aloisio, who fled the collapse of his own home in L' Aquila, spent the days after the quake searching the rubble for survivors and then, with the help of friends, installing free wireless Internet access for all of the town's tent camps.

Other Gran Sasso employees who lost their homes found temporary shelter in towns outside the earthquake zone, commuting 120 miles or more to work.

The faculty of the university physics department will remain at Gran Sasso for the rest of the year. The laboratory management continues to discuss other ways of helping the university and the villages.

Tona Kunz