

## SCIENCE FEST FEEDS HUNGER FOR KNOWLEDGE



**Hammering nails with  
a banana to spark  
interest in science and  
technology**



**BY TONA KUNZ**

Below: Physicist Paul Gueye push starts a hovercraft powered by a leaf blower to demonstrate principles of force and motion.

Photos: Reidar Hahn, Fermilab

Paul Gueye wades into the crowd and clears a circle on the ground for a piece of wood the size of a tractor tire with a leaf blower protruding from its center. He gestures for a boy to sit on what looks like a homemade version of a Sit 'n Spin toy.

Within seconds the boy is hovering inches off the ground. His smile widens as he floats forward, as if riding a giant air hockey puck.

The physics of force and reaction convey this "magical" ability to hover, the crowd hears from Gueye, who studies quarks at Thomas Jefferson National Accelerator Facility in Virginia. He hopes the lesson sinks in, but if not, that's OK. For now, exclamations of "Cool!" emanating from the crowd will do.

Ooh-and-ahh moments are a staple of the largest national science and engineering festival ever held. More than 1500 hands-on exhibits and 75 stage shows on and near the Washington, DC, National Mall highlight the wonders of science.

Inner-city students line up for autographs from Nobel laureate Leon Lederman, discoverer of the muon neutrino. Girl Scouts rush from exhibit to exhibit to earn merit badges and come face to face with dozens of female biologists, mathematicians and physicists. Parents with children from preschool to high school join retirees, school children on field trips and vacationers milling about the inaugural US Science and Engineering Festival during a late October 2010 weekend.

Close to a million people spend the weekend listening to rappers and comedians promote the fascination of science. They wield hammers made with bananas dipped in liquid nitrogen and eat DNA helixes made of marshmallow and toothpicks. Building on the event's success, a second festival is planned in Washington, DC, April 27–29, 2012.

While the festival features fun for young and old, leaders of industry, government and academia consider it serious business. The need to reinvigorate the nation's commitment to science, engineering and math has drawn together 850 universities, schools, companies, science and engineering societies, research organizations, and federal funding agencies, including the Department of Energy, which contributes funding and exhibits.

Biotech entrepreneur Larry Bock conceived of the festival after seeing similar expos in Europe and struggling to find qualified Americans to fill advanced science and engineering positions in his companies. US universities award two-thirds of PhD degrees in engineering to non-US citizens, and more English-speaking engineers come from China than from the US, according to Norm Augustine, former CEO of Lockheed Martin and festival host.

"We are outsourcing our security, our medical, everything. That's scary," says teacher Judith Haskins, as she watches Fermilab scientists explain research at the only US national laboratory devoted to high-energy physics.

Often, the spark of interest in science begins to fade in the early grades. By age 15, US students rank 21st in science among students in 30 developed nations, according to a 2006 study quoted by Alan Leshner, CEO of the American Association for the Advancement of Science.





Top: More than 1 million people converged on the National Mall for a weekend science fest. Middle top: Fermilab Nobel laureate Leon Lederman signs autographs. Middle bottom: Brookhaven National Laboratory uses races to teach kids about magnet technology. Left: Children learn how designers use math to attach shapes to form a giant ball.



day in the life: science fest



Left: Eager children catch balls flung by a robot built by teenagers. Below: At the Smithsonian Astrophysical Observatory booth, children build models of the universe by putting marbles in jars. Colored marbles represent regular matter, which constitutes just 4 percent of the universe; black marbles stand for the resist, made up of dark matter and dark energy.



Far left: Children strain to touch soap bubbles created in a liquid nitrogen explosion at Fermilab's Mr. Freeze show, which demonstrates how cryogenics work and how that ties into the lab's experiments. Below left: Galileo, the father of modern observational astronomy, shows off improvements to his telescope.



Ruth Van de Water knows how that spark needs nurturing. She urges youngsters to give science a second chance as she uses a ball-rolling game to demonstrate how physicists use particle collisions to probe subatomic particles.

Van de Water, a physicist studying rare particle interactions at DOE's Brookhaven National Laboratory in New York, tells the children that she got C's in high school physics and found it boring. A required college physics class exposed the would-be chemistry major to a more interesting teaching method and led her to a career in physics.

"It was fun, and I liked the people going into it," she says.

Haskins and fellow teachers at a Virginia elementary school hope to give the 150 school children they have brought to the festival that same kind of "aha" moment. They are on a crusade to get kids involved in science at the earliest age. They struggle with how to interest students, as well as with the notion that people have to be "rocket-scientist smart" to do science.

"That is just not true," Van de Water says. "You have to be averagely smart and then you have to work really hard. I don't think this comes easy to anyone at all." But neither do careers such as medicine or quarterbacking for the Chicago Bears.

Vanessa McNeil, of Washington, DC, brought her 7- and 3-year-old daughters to the festival to show them the varieties of science. The girls walk wide-eyed through a mock accelerator tunnel pulsing with lights. Pretending to be a neutron beam in the spallation neutron source at Oak Ridge National Laboratory in Tennessee, the girls eventually collide with a mock target, pushing a wall button and igniting a burst of red and blue light. Little jaws drop; mom smiles.

"I just want to keep them interested, even if they don't go into science," McNeil says. "Science and math are in every part of our lives, even if I'm baking cookies."



Top: Vanessa McNeil and her daughters follow the path of a neutron in a mock-up of the Oak Ridge National Laboratory's Spallation Neutron Source accelerator. Middle: Staff at the DOE booth explain emerging technologies and sustainability programs. Bottom: Giant prisms demonstrate light refraction.

