

## NEW from Amptek Digital Multichannel Analyzer



The MCA8000D is a full-featured digital multichannel analyzer intended to be used with a wide variety of detector systems.

The easy to use 'Pocket MCA' can fit in a shirt pocket.

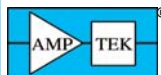
### FEATURES OF THE MCA8000D

- Compatible with traditional analog pulse shaping
- MCA and MCS modes
- High speed ADC (100 MHz, 16 bit) with digital pulse height measurement
- 8k data channels
- Minimum pulse peaking time 500 ns
- Conversion time 10 ns
- Sliding-scale linearization
- Differential nonlinearity  $< \pm 0.6\%$
- Integral nonlinearity  $< \pm 0.02\%$
- Two peak detection modes for nuclear spectroscopy or particle counter calibration in clean rooms.
- Two TTL compatible gates for coincidence and anticoincidence
- USB, RS-232, and Ethernet communication interfaces
- USB powered
- Dimensions: 125 x 71 x 20 mm
- Weight: <165 g

### Free Software

Free Software Development Kit (SDK). Complete protocol and example code for custom software applications.

Free Display and Acquisition software.



**AMPTEK Inc.**  
[www.amptek.com](http://www.amptek.com)

## Particle Fever: A look behind the scenes of the Higgs discovery

On 4 July 2012, the discovery of the Higgs particle at the Large Hadron Collider made headlines around the world. A few years earlier David Kaplan, a theoretical physicist at the Johns Hopkins University, had decided to record the historic events at the LHC. He teamed up with theoretical-physicist-turned-filmmaker Mark Levinson.

CERN



Their film, *Particle Fever*, follows six physicists (including Kaplan) from before the LHC turned on in 2008, through the jubilation of the first circulating beams, the setbacks when the LHC hit trouble, the first high-energy proton-proton collisions (see photo), to the spotting of the Higgs particle and physicists beginning to wrap their heads around the new discoveries. (See, for example, *PHYSICS TODAY*, October 2009, page 25, and August 2012, page 19.)

Physics explanations are presented in the film, but the main emphases are the scientists and the scientific process. With the film, Kaplan and Levinson aim to give the wider world a glimpse into the lives of physicists and to show that science, like art, is an essential human activity.

In one scene an economist asks about the financial gains to be expected from discoveries at the LHC. Kaplan is quick on his feet: "It's a simple answer: I have no idea. . . . It could be nothing, other than understanding—everything."

*Particle Fever* opens on 5 March at the Film Forum in New York City and soon thereafter at other theaters across the country (see [particlefever.com](http://particlefever.com) for schedule). See also the Q&A with the filmmakers at <http://www.physicstoday.org> in the Daily Edition's Singularities department.

**Toni Feder**

## Taking stock of the nanotechnology consumer products market

A private database in the US invites nanomaterials manufacturers to volunteer their data; similar measures in Europe want that reporting to be mandatory.

Children's toys coated with anti-microbial silver nanoparticles and bicycle tires spiked with grip-improving carbon nanotubes are among the more than 1600 consumer products logged in the Nanotechnology

Consumer Products Inventory (CPI). The free online database (<http://www.nanotechproject.org/cpi>), which lists products claiming to contain nanomaterials, was created in 2005 by the Woodrow Wilson International Center

for Scholars, based in Washington, DC. At the end of its first year, the CPI contained 54 products. Back then, “most people talked about such products in the future tense,” says Wilson Center researcher Todd Kuiken. “We wanted to show what already existed.”

In the intervening years, the database grew, and it began to be criticized for not containing scientifically useful data. The CPI’s intended purpose was to stimulate discussion on the emergence of nanotechnology in commerce, but people were “misusing the information in the media and in peer-reviewed literature to make safety and toxicity claims,” says Kuiken.

So last fall, in response to those criticisms, the database received an overhaul, thanks to \$25 000 from the Virginia Tech Center for Sustainable Nanotechnology, the Wilson Center’s new partner on the CPI project. Besides identifying the name of the product, manufacturer, and the nanomaterial ingredient, the database now includes scientific and safety information, such as the nanomaterial’s function and toxicity. Adopting a crowdsourcing model, the database invites registered users to upload relevant data from scientific literature and other publicly available sources.

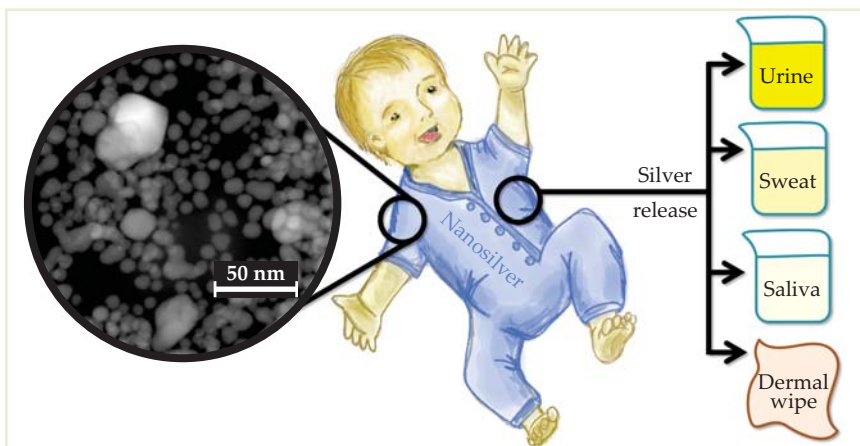
## Verifying the claims

Prior to the upgrade, many researchers in the Virginia Tech Center for Sustainable Nanotechnology used the CPI to find out what types of products and nanomaterials were entering the consumer market, says the center’s associ-

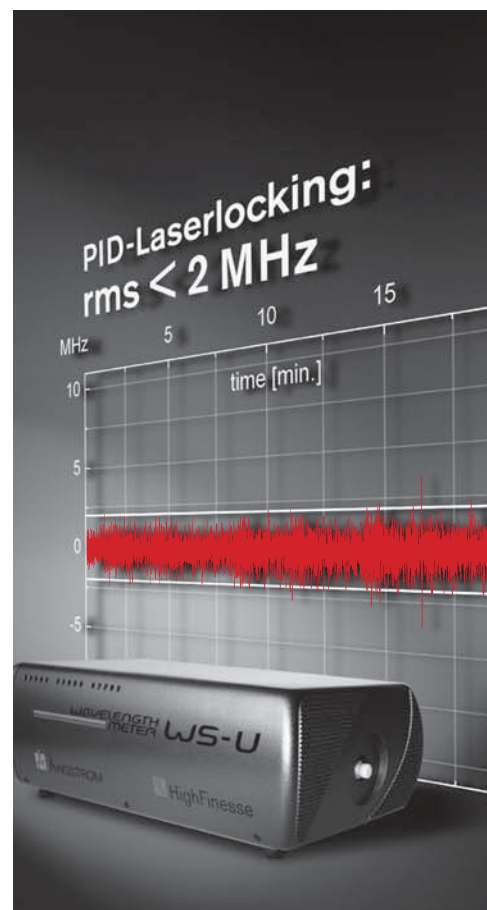
ate director, Marina Quadros. That information was then used to “identify new areas of research and to justify the need for further work assessing the environmental and human implications of nanotechnology.” The new CPI has search tags to “better describe the nanomaterials within each product, such as size and shape, composition, and location within each product, and the potential human exposure routes,” she says.

But according to the CPI’s own new data-quality rating—called “How much we know”—fewer than 10% of the entries currently provide supporting evidence that the nanomaterial works as claimed, or is even present in the product. One that does is an engine-oil additive under the “extensively verified claims” category, which identifies the nanomaterial (tungsten disulfide nanoparticle), its function (lubricant), its location in the product (suspended in liquid), and its potential human exposure pathway (dermal absorption and inhalation). The entry also includes quotes from research papers that validate the function and performance claims of the nanomaterial.

In contrast, the only information identifying the nanomaterial in a mountain-climbing ice axe found under the “unsupported claims” category is a quote from the manufacturer claiming that the product is made from a patented “Nanoflex” steel alloy that is “60% stronger than normal steel.” To make such data more reliable, the CPI “most needs the participation of contributors,” says Quadros. “In order to keep up with the fluidity of the consumer



**Touted as having antimicrobial benefits**, nanosilver from fabrics, a plush toy, and other children’s products accumulates mostly in urine and sweat, according to a 2013 *Environmental Science and Technology* paper. Lead author Marina Quadros says she mined the Nanotechnology Consumer Products Inventory for some of the items used in the study, which was done in collaboration with researchers at the Consumer Products Safety Commission and the Environmental Protection Agency. (Adapted from M. Quadros et al., *Environ. Sci. Technol.* **47**, 8894, 2013.)



## HighFinesse-Ångström Wavelength Meters

**Accurate Like Your Research  
Redefining Performance**

- Most stable and reliable
- **NEW** Pulsed & cw for 192 nm – 11  $\mu\text{m}$
- Fastest measurement: 600 Hz
- Multichannel 1 to 8 lasers



*A Passion for Precision.*

Phone: (585) 657-6663  
sales@toptica-usa.com  
www.toptica.com  
www.highfinesse.com

product market, we need help from manufacturers and researchers in updating the CPI data."

Another criticism is that the CPI does not accurately reflect the size of the market. Given the website's disclaimers, that criticism is unfair, says Duke University research scientist Stacey Frederick, who studies the impact of nanotechnology commercialization on industries and on geographic regions. "People were citing the number of products listed on the site as an official number of the market size, because there aren't many other readily available sources to cite for this."

## Lists of shame?

In Europe, some consumer groups are also tracking products containing nanomaterials. In 2012 the Danish Consumer Council launched the Nanodatabase, which includes more than 1200 such products. Also in 2012, the European Association for the Coordination of Consumer Representation in Standardisation (ANEC) and the European Consumers' Organisation (BEUC) published a database of 117 consumer products in the European Union market claiming to contain silver nanoparticles.

Unlike the CPI, the European databases explicitly seek to raise awareness of nanotechnology's potential risks and to encourage government regulation. Products in the Danish database are color coded according to their potential risk to human or environmental health. (The CPI "refrains from making such

judgment on the products because we seek active participation from manufacturers," says Quadros.) The ANEC/BEUC collaboration urges the US and the EU "to set up an extensive mandatory reporting scheme of all nanomaterials used in all products available on the market"—already a requirement in France and one that Denmark is considering. One EU regulation already in place forces cosmetics manufacturers to provide the name of the nanomaterial—followed by the word "nano" in brackets—in the list of ingredients.

Government agencies in the US have been slower to act. The Consumer Product Safety Commission does not yet regulate nanomaterials, but it engages in environmental, health, and safety R&D through the interagency National Nanotechnology Initiative (see the report on NNI in *PHYSICS TODAY*, September 2013, page 21). The Food and Drug Administration, which regulates medicines, medical devices, foods, and cosmetics, and which also conducts R&D through NNI, has invited the cosmetics and food industries to consult with them before taking their products to market.

Not surprisingly, representatives from the private sector chafe at regulation. Steffi Friedrichs, director general of the Brussels-based Nanotechnology Industries Association, says her organization and its members do not support the idea of government-mandated reporting schemes. And the problem with the CPI and other inventories based pri-

marily on product claims, she says, is that such databases contain "biased information" and "during the current debate on nanomaterial safety, [they] tend to unjustifiably turn into lists of shame."

**Jermev N. A. Matthews**

## news notes

### Nuclear weapons costs detailed.

Over the next 10 years, the US will spend \$355 billion for nuclear weapons, including \$105 billion at Department of Energy national laboratories and facilities for warheads, naval reactors, and operations, according to a Congressional Budget Office analysis. The watchdog agency projects that between 2014 and 2023, DOE will spend an additional \$74 billion on nuclear weapons legacy costs, including \$67 billion for environmental and cleanup costs at weapons facilities. For fiscal year 2014, DOE requested \$8.3 billion to support nuclear weapons-related work, while the Department of Defense requested \$14.9 billion for nuclear forces.

According to the analysis, the sea-based nuclear force, which will require an estimated \$82 billion to maintain and modernize during the next 10 years, will be the most expensive component of the nuclear triad. Much of that is to pay for two new ballistic missile submarines. The cost for the land-based force is estimated at \$24 billion, while the bomber force is expected to cost \$40 billion.

DK ■

## Recently on physics today online...

open online courses, or MOOCs, and other modern innovations.

### ► Points of View

Mohamed Gad-el-Hak of Virginia Commonwealth University argues that traditional methods of teaching are more effective than massive



### ◀ Enterprise

A young company in Rotherham, England, has devised new, eco-friendly laundry technology based on lentil-sized polymer beads.



### ► Singularities

Career consultant Alaina Levine offers advice on how to go about landing your very first—or next—job.



[www.physicstoday.org](http://www.physicstoday.org)



### Associate Editor

*Physics Today* is looking for a creative, talented, energetic individual to edit feature articles and other material for the magazine, contribute to the Search and Discovery department and supply material for [physicstoday.org](http://physicstoday.org).

The successful candidate will

- Edit manuscripts for organization, content, balance, clarity, visual appeal, and length, rewriting as needed, working closely with authors.
- Follow advances in cutting-edge research, interview appropriate scientists, and synthesize information to create accurate, balanced, and engaging research news stories.
- Contribute to the general pool of ideas at *Physics Today*.

**Requirements:** PhD in a physics-related science or equivalent experience; demonstrable ability to solve substantive editing problems; demonstrable reporting and writing skills; excellent command of written English; excellent interpersonal and communication skills; ability to meet deadlines.

*Physics Today* is published by the American Institute of Physics, an Affirmative Action and Equal Opportunity Employer that offers competitive salaries and excellent benefits. To apply, please send an informative cover letter with your resume and salary requirements to:

**AIP Human Resources** [aiphr@aip.org](mailto:aiphr@aip.org)