



MAR 2008

A Fast Read on the Latest in Lab Automation

This Month's Lab Man Podcast and Blog

Is LabAutomation Moving?

Where would you like to see the LabAutomation conference located? ALA is investigating venues for 2011 and beyond, and we'd like your feedback! Continue in Palm Springs? San Diego? Atlantic City? Listen to the Podcast, read the Blog (now open to members and non-members alike) and ENTER YOUR COMMENTS as The Lab Man discusses conference venues with the ALA Director of Event Management and the ALA President. [Podcast](#); [Blog](#).



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 - Senior Scientific Manager - Compound Management/Early Leads
- Wyeth**
 - Principal Research Scientist II, API
- Schering-Plough**
 - Research Investigator Analytical Chemist and more...

Cross-Industry News

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Food Industry Tests Techno-Tasters to Judge Flavor

Washington Post (03/10/08) P. A8 ; Weiss, Rick

Recent improvements in sensors, and in the computer programs that interpret their inputs, have led to the development of electronic taste and smell sensors that could be more accurate than humans. In a recent test, an electronic tongue and nose were able to distinguish between 53 glasses of wine, correctly identifying every bottle. Furthermore, the sensors were able to determine that the grapes used in 23 of the bottles were grown in one region of northern Italy, while the rest were grown in an area only 60 miles away. Meanwhile, the Agriculture Department launched a program last month that uses machines to grade livestock carcasses as USDA Prime, Choice, or Select. The robotic graders, currently being tested at four Nebraska slaughterhouses, capture photographic images of sides of beef as they pass by at rates of up to 400 head per hour. The graders examine the rib-eye muscle, measuring the redness of the meat, the amount of marbling with fat, and the thinness of the outer fatty layer. Human graders confirm the machines results and override the robots when necessary, but officials say the degree of accuracy has been very high. Other countries are making similar advancements. A Japanese consortium recently released a Health and Food Advice Robot that can distinguish between 30 kinds of wine and various cheeses and breads, and warns its owner against poor eating habits. In Russia, St. Petersburg University researchers have developed an electronic tongue that can distinguish among various blends of coffee or soft drinks just as accurately as people.

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MIT Group Develops Bio-Terror Sensor

Boston Herald (03/09/08) Underwood, Mike

Scientists at MIT say they have developed new sensing technology that is capable of detecting airborne pathogens 17 minutes faster than current devices. The Panther (PAtrogen Notification for THreatening Environmental Releases) device, which is funded by the Pentagon, makes use of cell-based sensor technology known as Canary, named after the birds sent into mines to detect dangerous gases. The Canary sensor is capable of picking up a positive reading with only a few dozen particles per liter of air. "Panther is designed to be an early- warning system for airborne, bio-terrorism agents," says Todd Rider, a member of the development team at MIT's Lincoln Lab Biosensor and Molecular Technologies Group in Lexington, Mass. "There is a real need to detect a pathogen in less than three minutes, so you have time to take action before it is too late." Panther can detect 24 pathogens, including anthrax, plague, smallpox, tularemia and E. coli; and can be used in buildings, subways and other public areas. The technology also has potential uses in food-processing plants or in medical diagnostics.

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Nanotech Strategy

Chemical & Engineering News (03/03/08) Vol. 86 , No. 9 , P. 29 ; Hanson, David

Nanotechnology products are widespread in a number of industries, yet there remains a limited amount of knowledge concerning the medical effects of these products. To improve research surrounding the potential for these materials' hazard, the federal-based National Nanotechnology Initiative (NNI) was established. NNI has released the "Strategy for Nanotechnology-Related Environmental Health and Safety Research" report outlining research in areas such as instrumentation and analytical methods, nanomaterials and human health, nanomaterials and the environment, human exposure assessment, and risk management methods. Though the government is expected to spend nearly \$60 million on environmental, health, and safety research this year, some say such endeavors fall short of addressing the detrimental potential of nanotechnology products. Human exposure remains a crucial consequence of hazardous nanotechnology products, while critics regard the government's effort as disproportional compared to other areas that receive more funding. Environmental Defense senior scientist Richard A. Denison says the government should increase their funding for organizations such as the National Institute of Occupational Safety & Health, particularly because the effects of many nanotechnology products have yet to be discovered. He advocates an independent assessment of the National Academy of Sciences (NAS) to conduct the progress of nanotechnology research to prevent conflict of interest, noting the NAS would be able to more accurately allocate funding appropriately.

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Scientists Embed Radiation Detector Into Cell Phone

Mobile Radio Technology (03/01/08) P. 18 ; Roberts, Mary Rose

Developing a system of networked cell phones that can detect radiation from dirty or nuclear bombs is the goal of a joint academic/Indiana state project recently announced by Purdue University researchers. Under the leadership of Purdue director of radiation laboratories Jere Jenkins, the researchers have been laboring for two years on a system that could cover the United States with scores of phones outfitted with radiation sensors. "We wanted to create another layer of defense from these sort of terrorist attacks," noted Jenkins. Data from cell phones is transmitted across the network into a database systems that grades threat level, location, and other factors while also interpreting data from multiple sensor types, he said. Current tests demonstrate that the sensors can read a weak radiation source from 15 feet away. Jenkins reported that the system could be employed to detect radioactive material leakage or could be educated to disregard known sources of radiation. "It can isolate probable targets versus false targets," he said. The effort was underwritten by a \$25,000 proof-of-concept seed grant from the Indiana Department of Transportation through the Joint Transportation Research Program and Purdue's School of Civil Engineering.

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The World's Smallest Crime Lab

Popular Science (03/08) Bryner, Michelle

Crime scene investigators could perform important biological analyses using lab-on-a-chip devices such as a new micro-microwave capable of heating pinhead-size drops of liquid to precise temperatures. The device, the product of a collaboration between a National Institute of Standards and Technology (NIST) group and George Mason University researchers, features a trio of gold wires laid onto a thin glass slide and partitioned by incredibly thin channels. The sample liquid is pumped into the channels, and the central wire emits microwave energy via a connection to a microwave signal generator. The energy is absorbed by the liquid, whose temperature rises. "It works just like a kitchen microwave oven except that it can deliver whatever microwave frequency we choose for exact heating," notes NIST group leader Michael Gaitan. Such a breakthrough could potentially be applied to a portable DNA-analysis kit that uses evidence at a crime scene to generate genetic markers of the perpetrator's identity. A commercial prototype of the microwave technology could be ready within 12 months with corporate funding, according to Gaitan.

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Peak Addition

Scientist (03/08) Vol. 22 , No. 3 , P. 71 ; Perkel, Jeffrey M.

To characterize proteins using mass spectrometry, it is necessary to use additional tools along with matrix-assisted laser desorption/ionization and electrospray ionization. When these two techniques are used, "ions are formed by adding or removing a proton, and empirically, you don't get the same signal response for the same amounts of different samples," explains Catherine Fenselau, professor of chemistry and biochemistry at the University of Maryland. "So the peak height or volume is not necessarily representative of the starting amount." One tool that enables mass spectrometry to become quantitative is proteolytic (18) O labeling, which is comparatively less costly and is useful for comparing protein abundance in cells. Another tool is single-reaction monitoring, which measures the abundance of a given parent ion based on the abundance of its fragmentation products. The transitions of parent ion to fragment are unique. A third tool is Applied Biosystems' iTRAQ (isobaric tags for relative and absolute quantification). The reagents are useful for measuring multiple samples simultaneously, as each isobaric tag has the same mass. Other tools include fractionating proteins using liquid chromatography prior to mass spectrometry and a metabolic labeling strategy called "stable-isotope labeling with amino acids in cell culture."

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Linescan Camera, Telecentric Lens, and Novel Lighting Automate Slide Reading

Vision Systems Design (03/08) Laird, Joyce

The Swedish company Amic has developed high-speed, point-of-care technology for blood lab diagnostic work. The 4castechip machine is a polymer slide divided into micron-sized sections, each holding a drop of fluid that can be processed through a proprietary reading device. Amic turned to BioDot--a supplier of system tools for the research, development, and commercialization of diagnostic tests--for assistance in automating the dispensing process. MoviMED, a vision-systems integrator, helped to develop a customized vision system for accurate dispensing. The stand-alone, four-axis motion system loads and unloads manually, but the actual processing is completely automated. "There is always a bit of mechanical play in any system, even on a small scale," says Markus Tarin, president and CEO of MoviMED. The preprogrammed individual pass/fail parameters enable the vision system to automatically know any "good dispense." An automated tip calibration and drop verification routine was also built into the dispensing system.

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Live Cells Test for Food Pathogens

United Press International (02/29/08)

Scientists at Indiana's Purdue University have developed a test that uses live mammalian cells to detect the presence of pathogens and toxins in thousands of food and water samples in as little as an hour. In a report published in the journal *Laboratory Investigation*, researchers note that they were able to detect the presence of *Listeria monocytogenes* and several species of *Bacillus* by using optical equipment and computer software to measure the signaling chemical the cells released when they came into contact with the pathogens. The technique could potentially be used in biosecurity and food safety applications, said Purdue food scientist Arun Bhunia.

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Microchip Spots Rare Tumor Cells in Blood

Journal of the American Medical Association (02/27/08) Vol. 299 , No. 8 , P. 889 ; Hampton, Tracy

Massachusetts General Hospital researchers have developed a lab-on-a-chip device that can detect tumor cells and monitor cancer patients' treatment. The silicon chip contains epithelial cell adhesion molecule, a protein that can be detected on solid tumors, that is used to detect tumor cells from peripheral blood samples. To test the efficacy of the microchip device, researchers analyzed its response to patients with lung, prostate, breast, pancreatic, and colorectal cancer; the chip demonstrated more than a 99 percent accuracy rate. Though technology such as flow cytometry and immunomagnetic beads has been used for detecting tumor cells, the new device is more sensitive and has the capacity to test a greater quantity of blood. The device is expected to be a medical breakthrough for physicians monitoring cancer patients, as the chip detects the change in the size of tumors. Researchers said comparable technology could be used to detect viruses and similar rare blood components, while they intend to expand their efforts for advancing the technology at the hospital's Center of Excellence in Circulating Tumor Cell Technologies.

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Silicon Lasers Approach Mid-IR

Photonics.com (02/25/2008)

The wavelength of silicon laser operation could be extended from the near- to the mid-infrared (IR) with Intel's development of silicon-chip-based lasers that tap "cascaded Raman lasing." Intel researchers led by Haisheng Rong report that their silicon Raman laser operates "tantalizingly close to the mid-infrared window," and the hope is that the optimization of the design should extend wavelengths even further and enable even more applications that include lab-on-a-chip technology. "A Raman laser's output beam--which is always at a longer wavelength than the pump--can itself act as a pump to generate Raman lasing at an even longer wavelength," notes Rong. Director of Intel's Silicon Photonics Technology Lab Mario Paniccia says important spectroscopy applications such as gas sensing are currently only possible with heavy, costly, or cryogenically cooled lasers. "In addition to its low-cost material and CMOS compatible fabrication aspects, the cascaded silicon Raman laser offers unique advantages such as wavelength selectivity and spectral purity that can compete with complex and bulky solid state laser systems, but in the small form factor of semiconductor lasers," says Rong. "Single-mode, room-temperature operation is obtained from a monolithic chip without the extra cost associated with additional cavity components and their assembly and alignment." Rong and colleagues detail their work in a paper published online by Nature Photonics.

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Lab-on-a-Chip Looks Inside the Brain

LabTechnologist.com (02/19/2008) Kidwell, Huw

Researchers from the Johns Hopkins Whiting School of Engineering and Johns Hopkins School of Medicine created a lab-on-a-chip that aims to facilitate controlled experiments on nerve cells. Featuring a system of channels and wells, the device allows scientists to use different chemicals on the chip surface or in solution to observe the reaction of the nerve cells and determine the direction neurons grow. "The ability to combine several different stimuli in the chip resembles a more realistic environment that nerve cells will encounter in the living animal," says John Hopkins School of Medicine and Institute for Cell Engineering associate professor of neurology Dr. Guo-li Ming. "This in turn will make future studies on the role of neuronal cells in development and regeneration more accurate and complete."

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Airbrush Useful for Making Microelectrodes, Not Just Art

Science Daily (02/19/08)

University of Florida engineering students have devised a method to create microelectrodes with an airbrush that is reported in the online February issue of *Electroanalysis*. Microelectrodes play a critical role in lab-on-a-chip devices that are being developed for the identification of substances in blood, air, or other samples. "The idea was to try to find something cheap and quick, that we could do in our own lab without much expense," says University of California Irvine doctoral student Corey Walker. The airbrushing technique is a simpler strategy than screen printing, which is the industry standard for microelectrode fabrication. "A screen-printing machine useful for fabricating microelectrodes might cost \$10,000, whereas you can buy an airbrush for less than \$200," points out project overseer and professor Hugh Fan. "So this is a useful technique for small, custom projects." The students eventually used fully airbrushed electrodes to construct a practical sensor.

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High Speed Robots to Replace Animal Testing of Toxic Chemicals

Environment News Service (02/14/08)

The U.S. Environmental Protection Agency (EPA) and National Institutes of Health (NIH) have announced a new agreement to use robotic technology to test suspected toxic chemicals in a bid to replace animal testing. Under the agreement, NIH Chemical Genomics Center high-speed automated screening robots will be used to address the growing number of new chemicals requiring testing, high testing costs, and public unease about the use of animals for such testing. The center's robots use cells and isolated molecular targets rather than lab animals and can screen the biological activity of more than a million chemical compounds a day to determine toxic effects. "This research collaboration has the potential to make crucial discoveries that will protect the public health by identifying and understanding chemical toxicants to which people are exposed," says NIH Director Elias Zerhouni. The agencies hope that the collaboration will jumpstart similar efforts across the toxicology community to rely less on animals and more on in vitro testing of human cells to identify toxic chemicals. "As our detailed research strategy continues to develop, we will welcome the participation of other federal partners, as well as interested public and private sector organizations, to make this vision of 21st century toxicology a reality," says George Gray, assistant administrator for EPA's Office of Research and Development.

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New Age of Molecular Diagnostics for Microbial Agents

New England Journal of Medicine (02/06/08) Whitley, Richard

Doctors have recently adapted a molecular identification method that could be used to detect and identify previously unknown pathogens. By using a form of high-throughput DNA pyrosequencing, doctors were able to diagnose a new arenavirus responsible for several fatal encephalitis cases. Similar techniques have been used to sequence large genomes. However, this method has not been previously used in pathogen discovery. Unlike traditional testing methods, metagenomic pyrosequencing allows laboratory scientists to consider a wider array of organisms. This capability makes it perfect for identifying unknown bacteria, fungi, parasites, or viruses. According to the Centers for Disease Control and Prevention, 40 percent of patients with central nervous infections never receive a concrete diagnosis of their condition. Acute respiratory tract infections are correctly identified in only 30 percent to 60 percent of cases. Researchers are hopeful this new application of metagenomic pyrosequencing could help them better identify microbial agents responsible for a wide variety of human diseases.

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The Pursuit of Automation

Energybiz (02/08) Vol. 5 , No. 1 , P. 58 ; Causey, Warren

To develop a robust transmission and distribution infrastructure, utilities are using artificial intelligence and other new technologies to build up their power grids. Jeanne Vold, lead director of IT for Northwestern Energy, says more utilities are endeavoring to cultivate T&D infrastructure that is “optimized, self-healing and resilient” in order to cope with the threats posed by impending power shortages, legislative fallout from global warming initiatives, aging workforce and other pressures. Many providers have had to answer these demands by relying more on artificial intelligence to deal with isolation and service restoration, fault detection, and other critical functions that would ordinarily be handled by field workers. Utilities are also getting help from new technologies that support two-way billing, load-balancing and other practices distribution generation will require. Communications experts predict utilities will soon be able to make immediate adjustments with the extensive use of intelligent instruments and IP-based communications networks that continuously forward data to them. Pacific Gas and Electric is among several utilities currently deploying automated restoration devices that automatically reroute power in the event of a power line malfunction.

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Bioterror Detection Draws Closer

Security Management (02/08) Vol. 52 , No. 2 , P. 30 ; Straw, Joseph

Researchers at Sandia National Laboratories and the Hercules, Calif.-based Bio-Rad Laboratories have developed a test that can detect human biotoxin infection within 15 minutes, not the hours or days it takes with other tests. During the test, a slide containing a network of small internal channels is inserted into the system’s diagnostic device along with a sample of the test subject’s blood, which is pumped into the channels. Antibodies for a particular pathogen are then treated with a fluorescent dye and pumped into the slide’s channels as well. Other antibodies can be dyed different colors and inserted into the slide as well to conduct simultaneous tests for different pathogens. If the pathogen is in the test subject’s blood, the antibodies will bond to them. The slide is then subjected to a mild electrical field, which causes the lone antibodies to move away from those that are bound to pathogens. The diagnostic device’s sensors detect the opposing flow of the antibodies and measures the volume of the flow, which in turn allows the device to determine the presence of the pathogen and the volume of the infection. The technology could eventually be refined to detect terrorist pathogens, such as anthrax, and could someday use saliva instead of blood.

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“We’re in our lab coats. Now what?”