

Search for Life on Mars Using University of NC Technology

Tech Journal South (06/12/08)

A microfluidic lab-on-a-chip (LOC) is expected to be used on the ExoMars rover mission scheduled for 2013. The LOC has been reinforced with perfluoropolyethers (PFPEs) to allow it to withstand the harsh conditions of the planned mission. A team from NASA's Jet Propulsion Laboratory in Pasadena, Calif., led by Peter Willis, developed the LOC by inserting PFPE membranes between layers of glass, according to a paper published in the UK journal *Lab on a Chip*. The LOC with PFPE was found to be easier to make and better performing than those made with materials like PDMS and PTFE (Teflon). In addition, the chip survived the equivalent of 1 million operations at temperature ranging from 50 degrees Celsius to minus 50 degrees Celsius. The credit card-sized device might be used to assess soil and rock samples from Mars for such things as amino acids and other biological compounds. The PFPE materials were invented by Joseph DeSimone, a chemistry and chemical engineering professor at the University of North Carolina. Jason Rolland, who worked under DeSimone as a graduate student, has licensed the PFPE technology from UNC through his company, Liquidia Technologies.

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Earmarks Lead to Blood Analyzer, Care Center

Courier-Post (N.J.) (06/11/08) Shamlin, Wilford S.

Kennedy Memorial Hospital in Washington Township, N.J., will soon have a new, \$1.4 million automated system that features a dual-platform analyzer capable of performing 85 tests on blood chemistry. The tests will be able to detect such things as levels of prostate-specific antigen, potassium, and thyroid hormones, said Zoe Rodriguez-Mazzoni, corporate director of pathology and lab medicine. The system also has robotic arms and electronic bar code scanners that retrieve vials of blood samples from storage for testing. Both the analyzer and robotic component are programmed with intelligence to do the correct tests and forward the blood specimens to the appropriate area. If additional tests need to be done, physicians can instruct the automated system to perform them, rather than request the patient to provide an extra blood sample. Kennedy Health System's purchase of the system, which is manufactured by California-based Beckman Coulter, was facilitated by a \$492,000 federal earmark obtained by U.S. Rep. Rob Andrews (D-N.J.).

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FDA Asks for \$65 Million to Better Track Food Contamination

NextGov.com (06/11/08) Brewin, Bob

The Food and Drug Administration (FDA) wants to add an extra \$65 million to its fiscal 2009 IT modernization budget to make its databases interoperable, according to the FDA's CIO, Tom Stitely. He said that at present, the agency relies on multiple identifiers to trace the origin of food products, drugs, and medical devices. However, these identifiers are unreliable because the information on vendor facilities and contact points is not updated across all systems. Moreover, these identification systems are scattered across different areas of the FDA. By making the databases interoperable, the information could be used to trace foods, drugs, and devices to companies, vendors, or manufacturers. Access to such data would be especially useful for tracking food contaminations, said Robert Miller, FDA's deputy budget officer. The budget increase would let the FDA create unique identifiers for each food vendor and device manufacturer under an initiative called "harmonized inventory," said Stitely. The FDA would also use the budget increase to acquire supercomputers, he said.

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GE Venture to Develop 'Virtual Microscope'

Wall Street Journal (06/05/08) P. B5 ; Thurm, Scott

Omnyx is a company formed by General Electric and the University of Pittsburgh Medical Center (UPMC) to market a "virtual microscope" capable of scanning and storing images electronically so that doctors can share information more easily and pathology labs can raise their output by up to 20 percent. The project targets tissue samples to diagnose cancer and other diseases, which are mostly viewed individually by physicians under microscopes. Scanning and storing images digitally is expected to simplify the search for patterns that could help identify new disease markers, although it is doubtful that the technology will make the storage of samples unnecessary, given the need to test samples biologically or chemically. Motivating GE's search for an academic partner was the need to better customize the virtual microscope system for a pathology lab's workflow, says GE's Mark Little. "We had skills around imaging, but not the detailed knowledge around pathology that UPMC has," he notes. Michael Feldman with the University of Pennsylvania Health System reports that the adoption of digital technology has proceeded more slowly in pathology than in other diagnostic fields due to the difficulty of scanning microscopic images.

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State Still Investigating Source of Salmonella Outbreak

Quay County Sun (NM) (06/04/08)

In New Mexico, the state Department of Health has employed a DNA fingerprinting technique to identify cases involved in a salmonella outbreak. Almost 40 people have been infected by the Salmonella Saintpaul strain that has been linked to consuming uncooked tomatoes. The department has collaborated with the New Mexico Environment Department and the Food and Drug Administration to determine if other tomatoes in the state have the same Salmonella strain that has caused illness in a number of people. Thus far, DNA fingerprinting has assisted the department's Scientific Laboratory in correlating 28 cases of Salmonella Saintpaul to the outbreak strain. The Department of Health is warning the public that tomatoes should be washed and cooked thoroughly to avoid contamination from the strain.

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Gene Gun, Patches 'to Replace Vaccine Needles'

Australian Broadcasting Corp. News (06/04/08)

Mark Kendall, a professor at the University of Queensland in Australia, has suggested that abrasive patches could become a preferred method of delivery for vaccines. "To the naked eye it just looks like any other patch but if you look at it very, very closely under a microscope you'll see that it has thousands of little tiny projections that break the outer layer of the skin and put the vaccine to where it needs to go," explains Kendall. He adds that a gene gun, which rapidly shoots tiny DNA-coated microparticles into the skin, could be useful for delivering pandemic influenza vaccines. "I know that might sound a little bit out there but it's actually a practical delivery device," he says. Kendall developed the new technologies and won the annual Amgen Medical Research Award in Melbourne.

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Microrobotic Ballet

Duke University News & Communications (06/02/08)

Duke University researchers have developed autonomous, self-organizing microscopic robots. "It's marvelous to be able to do assembly and control at this fine resolution with such very, very tiny things," says Duke professor Bruce Donald. Each microrobot is shaped similarly to a spatula, but measures only a few millionths of a meter. The microelectromechanical systems (MEMS) microrobots are almost 100 times smaller than any previous robotic designs of their kind, Donald says. The researchers produced one video in which two microrobots are dancing to a Strauss waltz on a dance floor only 1 millimeter in size, and another video in which the devices pivot in a precise fashion whenever the microrobots drop their boom-like steering arms down to the surface. The research group's latest accomplishment was getting five of the devices to group-manuever in cooperation under the same control system. Donald says the research is the first implementation of an untethered, multi-microrobot system. The microrobots are built with microchip fabrication techniques and are designed to respond differently to the same single global control signal. Donald says a key to the research was designing multiple microrobots that all work independently, even while they receive the same power and control, which is accomplished through slightly different dimensions and stiffness levels in each microrobot.

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Bioident to Work on DARPA Project

United Press International (05/30/08)

Bioident Technologies will work with the U.S. Naval Research Laboratory to develop a lab-on-a-chip portable diagnostic system. Their work will support the Printed Diagnostic Arrays project, which aims to demonstrate the capabilities of biosensors with integrated printed optoelectronics. According to Bioident, which received the contract from the U.S. Defense Advanced Research Projects Agency, its printed optoelectronic technology sets a precedent for enabling the functionality of expensive lasers and charge-coupled device cameras directly into the lab-on-a-chip system. Bioident said this factor facilitates the progress toward development of mobile and convenient laboratory equipment.

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Vaccine Test Marks Rise of Commercial Research in Space: NASA"

Agence France Presse (05/30/08)

Spacehab's research endeavor to develop a salmonella vaccine in space could lead to a wave of new interest in space-oriented biotechnology investments. Three years ago, the U.S. portion of the International Space Station (ISS) was mandated to be open to private investments and subsequent developments. Though a lack of space, high costs, and demand for commercial research spots aboard the ISS has previously been limited, efforts from companies such as Spacehab have facilitated the expansion of biotech research beyond the planet. In the case of salmonella, the bacteria's quickly dissipating nature has prevented researchers from developing an effective vaccine, though previous missions have allowed researchers to detect specific strains useful to a vaccine. Two years ago, at the Durham (N.C.) Veterans Affairs Medical Center, Timothy Hammond and colleagues found that the strength of salmonella could be tripled in the micro-gravity environment of space, underscoring the potential for a salmonella vaccine developed from a specific strain.

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Lab-on-a-Chip Made of Paper

The Future of Things (05/28/08) Barr, Roni

Disposable diagnostic tests could perhaps be created through the work of Harvard's Whitesides Research Group, which may have hit upon a way to reduce the cost of microfluidics technology by exploiting the natural movement of liquid through paper. Relatively costly materials such as silicon, glass, or plastic are used to fabricate current microfluidic chips, which have minuscule valves and pumps that can be hard to manufacture. George Whitesides and his team at Harvard have constructed a microfluidic device on a very small paper square. The paper's natural network of capillaries channels the fluid sample to the wells at the branches of the paper, allowing for the concurrent performance of multiple tests. The size reduction also means samples can be much smaller, while the device's resistance to breakage, lightness, and disposability makes it practical for use in developing countries. The Whitesides team is aiming to minimize the level of expertise needed to use the paper tests by blending the tests with a system of cell phones for off-site diagnosis. Whitesides notes that in rural regions with a limited number of doctors, people who are trained to perform the tests would conduct them "and send them back to a central facility where a doctor looks at that information and [recommends] diagnosis and treatment without having to actually be there." The project's next phase is clinical trials and implementation in Africa, and the team envisions developing tests for food sources such as livestock and water. The researchers are currently testing the device's tolerance to extreme environmental conditions.

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Cheaper Gene Mapping

Scientist Live (05/28/2008)

At Sweden's Karolinska Institute, researchers are spearheading a DNA-sequencing effort that could considerably cut costs for human genome mapping. In the journal *Nature Biotechnology*, Sten Linnarsson and colleagues detail a method in which *E. coli* bacteria was extracted and sequenced into 200-nucleotide fragments. Using an instrument comprised of a microscope, an automated pipette, and a flow chamber, scientists digitally combined the sequences into the 4.5 million-nucleotide long *E. coli* genome. The microscope used in the study had the capability to photograph the DNA fragments, while scientists were able to simultaneously analyze millions of fragments per slide. The researchers anticipate that their DNA-sequencing technique could lead to analysis of larger, simultaneous DNA analysis and result in faster improvements in treatments for infections and disease.

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Engineers Invent Improved Cell-Sorter

Journal of the American Medical Association (05/28/08) Vol. 299 , No. 20 , P. 2378 ; Hampton, Tracy

Researchers from the Massachusetts Institute of Technology have developed a technique that could prove highly effective for the future separation of cells. The method is based on receptor-ligand adhesive bonds that can specifically target cells of research focus, thereby eliminating the general predicament of being unable to separate normal cells from cells of interest. A device is coated with material that interacts with the targeted research cells so that they stick, capturing these cells on one side of the device where they can later be collected. Current techniques such as fluorescence-activated cell sorting often involve multiple steps and a number of different devices that have the potential to damage cells and render them useless for analysis. Though lead author Rohit Karnik, an assistant professor of mechanical engineering at MIT, notes that it could take as long as two years to create a standard device for lab research using the technology, the device has potential as an inexpensive and simple method of sorting, particularly in areas that have few resources.

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Up From Desktops

Chemical & Engineering News (05/26/08) Vol. 86 , No. 21 , P. 13 ; Mullin, Rick

Microsoft, Dell, and Google are all developing laboratory information management systems designed to coordinate data collection and research processes for scientists. The offerings range from standard electronic laboratory notebooks to more specialized tools for health care and pharmaceutical scientists. Developers are unsure how much specialized IT knowledge to integrate into their products, though Microsoft has already rolled out several workable solutions. The software giant partnered with Infosys to create Scientist Workbench, an information and knowledge management system that uses Microsoft's business platforms and Web applications. Pharmaceutical giant Pfizer currently uses a different version of the product, called Biologist Workbench.

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Huge Gains Reported at Crime Lab's DNA Unit

Boston Globe (05/23/08) Ballou, Brian R.

At the Massachusetts State Police's crime lab DNA Unit in Maynard, laboratory automation has reduced the time needed for DNA techniques while increasing productivity. The M-48 machine has proved to be a particularly valuable tool for DNA extraction, enabling technicians to extract DNA in only an hour. Additional automated stations will be instated at the crime lab for facilitating DNA extraction, separation, and amplification--improvements that have led to the crime lab's ability to more quickly assist law enforcement. Forensic specialists have said that increased laboratory automation and funding have been crucial to the improved efficiency of crime labs, with the average time of processing a DNA case reduced by a third compared to the time needed for similar cases two years ago. In 2007, international risk management consulting firm Vance uncovered a backlog of about 7,500 cases at the Maynard laboratory that had not been analyzed. Speaking recently at the 14th annual Massachusetts Prosecutors Conference, Governor Deval Patrick noted that the crime lab has significantly reduced both its backlog and turnaround time.

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Enter, the Nanoscope

Nature (05/22/08) Vol. 453 , No. 7194 , P. 430

German scientists invented a three-dimensional microscope capable of viewing proteins one-fifth the size of those viewed in traditional fluorescent microscopes. The high-resolution "nanoscope" improves 3-D resolution and can view "slices" measuring 40 nanometres across, whereas a traditional scope images each sample "slice-by-slice" and can process slices no smaller than 200 nanometres across. The researchers, from the Max Planck Institute for Biophysical Chemistry in Gottingen, reported in Nature Methods that they used their device to create a picture of the fluorescently labelled "Tom20" protein in mitochondria and found that Tom20 forms clusters outside the mitochondrial membrane.

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Sharing a New Vision for Soldiers of the Future

Albany Times Union (NY) (05/21/08) P. C1 ; Rulison, Larry

The University at Albany's College of Nanoscale Science and Engineering has forged a partnership with the U.S. Army Research Laboratory for research and development on sensors, nanomaterials, and energy sources that could be of enormous benefit for tomorrow's soldiers. Such innovations may include mobile robotics that can search for terrorists, "smart bandages" capable of diagnosing wounds in the field, and lightweight batteries to power electronics in battle situations. The NanoCollege's Michael Fancher says the key to working with the Army is devising durable nanotechnology, while NanoCollege spokesman Steve Janack notes that the school will be able to attract more federal funding thanks to its partnership with the lab. He estimates that the federal government contributes only about \$100 million of the the \$4.2 billion in investment and funding at the NanoCollege. U.S. Army Research Lab director John Miller says the alliance will use existing funding at the two institutions, and that researchers working on similar projects will collaborate to "speed the path to commercialization." The alliance was announced at the NanoCollege's yearly industry conference, CIRCA '08.

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'Asbestos Warning' on Nanotubes

BBC News (05/20/08) Fildes, Jonathan

A study published in Nature Nanotechnology warns that specific lengths of carbon nanotubes have been found to trigger "asbestos-like" inflammation and lesions in laboratory animals. Study co-author Dr. Ken Donaldson said varying lengths of multi-walled nanotubes were injected into the abdomen of mice, and their effects were compared to that of asbestos fibers and flat carbon sheets introduced into another group of mice. Donaldson reported that the long nanotubes caused inflammation and lesions, although the researchers acknowledged that the connection between such nanotubes and cancers such as mesothelioma is unproven. Donaldson noted that among the unanswered questions is whether the nanotubes would even penetrate the chest cavity if inhaled. "The latest study suggests there could be a reason for concern and suggests there is an effect but it needs to be validated," said Dr. Steffi Friedrichs of the Nanotechnology Industries Association. Nevertheless, study co-author Dr. Anthony Seaton believes the report's findings, though unconfirmed, are enough to justify action by health regulators to prevent people's airborne exposure to such materials. He said this is especially relevant for people who participate in the manufacturing and disposal process.

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Massachusetts State Laboratory Plays Vital Role in Listeria Outbreak

Lab Matters (Quarter 2, 2008) No. 2, P. 12 ; Kubota, Kristy

Following an outbreak of *Listeria monocytogenes* in Massachusetts, epidemiologists and local health officials teamed to determine the origin of the outbreak. *Listeria* was linked to three deaths and a miscarriage, both cases that were traced to *Listeria* present in milk products. Employing Pulsed-field Gel Electrophoresis, scientists discovered a correlation between the isolate in pasteurized milk and the cases of *Listeria* in the infected individuals. Other samples of *Listeria* were found in the post-production area of the dairy. The findings underscore the necessity for PulseNet laboratories in identifying and isolating bacteria produced in food. Researchers say the significance of molecular subtyping is evident in the ability of scientists and public health officials to identify and redress a potentially hazardous human health situation.

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Nanotechnology: Benefits and Challenges to Laboratories

Lab Matters (Quarter 2, 2008) No. 2, P. 10 ; Bernard, Pamela

Nanotechnology is the future of scientific technology, yet the threats posed by materials manufactured within this sector remain unexplored. The production of nanotechnology devices to spur environmental developments has trumped efforts to examine the health impact and risks of employing this methodology. In the case of water filtration, chemical treatment and desalination techniques are being supplanted by nanodevices such as carbon nanotubes and nanoporous ceramics; the hazard potential of these technologies is still uncertain. Though the United States and European Union countries have attempted to expand research for more lucidly understanding the effects of nanotechnology, much research must still be completed. The Environmental Protection Agency has issued a white paper addressing the nature of nanotechnology, while the Centers for Disease Control and Prevention's National Institute for Occupational Safety and Health is continuing research for the potential exposure of nanotechnology workers. Rep. Albert R. Wynn (D-Md.), chairman of the House Subcommittee on the Environment and Hazardous Materials, plans to conduct a hearing addressing the shortcomings of regulations to protect individuals and the environment.

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