



### **Insightful Light**

*Science News (08/02/08) Vol. 174 , No. 3 , P. 22 ; Yeager, Ashley*

Though spectroscopy tools have advanced rapidly in the past decade, changes at the molecular level can be hard to detect. This could change with Raman spectroscopy, in which scientists aim a laser at a targeted molecule and measure how the wavelengths bouncing off the molecule differ from the wavelength of the original laser light. First demonstrated in the 1920s by Indian physicist Chandrasekhara Venkata Raman, this form of spectroscopy helps identify the molecular makeup of a compound, and it is currently used on surfaces to analyze soil minerals, new materials, and ancient artifacts. Eventually, Raman spectroscopy could be used on humans by doctors and dentists to detect tiny changes, such as the early formations of cancer cells or the tiniest sign of tooth decay. According to chemist Linda Lewis of the Oak Ridge National Laboratory in Tennessee, Raman spectroscopy might also be used in forensics to pick up fingerprints and other traces left on murder victims.

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### **Caltech Builds High-Resolution Microscope That Can Fit on a Chip**

*Computerworld (07/31/08) Gaudin, Sharon*

Researchers at the California Institute of Technology have devised a miniscule high-resolution microscope that can fit onto a computer chip, one that could be employed in the field to scan blood samples for malaria or to check water supplies for pathogens. Caltech professor Changhuei Yang reports that the optofluidic microscope could be incorporated in a cell phone and use sunlight for illumination. The device is assembled by placing a sheet of metal atop a grid of sensors and punching extremely small holes in the metal that connect to pixels on the sensor grid; on the top of the metal is a channel that will carry the liquid sample to be scanned. "Our research is motivated by the fact that microscopes have been around since the 16th century, and yet their basic design has undergone very little change and has proven prohibitively expensive to miniaturize," says Yang. "Our new design operates on a different principle and allows us to do away with lenses and bulky optical elements." The research that yielded the optofluidic microscope is underwritten by the Defense Advanced Research Projects Agency, the National Science Foundation, and the National Institutes of Health. Yang notes that the microscope chips could find use in devices that are implanted in the human body to track and isolate cancer cells in the blood.

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### **Slow to Pick Up the Pepper Trail**

*Washington Post (07/30/08) P. D1 ; Shin, Annys*

Modern techniques like DNA fingerprinting have helped the Centers for Disease Control and Prevention detect and connect outbreaks of food-borne illnesses, such as the recent cases of salmonella found in raw jalapeno peppers. However, investigations to determine how they happened can be delayed by differences among state and local health departments, says Michael Osterholm, director of the Center for Infectious Disease Research and Policy at the University of Minnesota. During outbreaks, such as the one involving E. coli in 2006, more affected states are overburdened with keeping up with illness cases rather than participating in the investigation, with all states operating at varied efficiency. While some states can take five weeks or more to test and send out the results of a specimen's DNA fingerprint, in Minnesota, where there is a centralized system of observing food-borne illnesses, the process generally takes just two to three days. Congressional hearings were scheduled on July 30 to address the issue.

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### **Defining DNA Differences to Track and Tackle Typhoid**

*Science Daily (07/30/08)*

Researchers led by Gordon Dougan from Wellcome Trust Sanger Institute are using next-generation DNA sequencing technologies to detect the genetic signature of *Salmonella typhi* in the hopes of typing the bacteria and identifying particular strains. They also are utilizing Google Earth to visualize outbreaks of typhoid fever based on this information, which will enable health officials to target immunization programs. According to Dougan, "This analysis suggests we may have found Typhi's Achilles' heel: in adapting to an exclusively human lifestyle, it has become complacent, its genome is undergoing genetic decay and it's heading up an evolutionary dead end in humans. We believe that concerted vaccination programs, combined with epidemiological studies aiming to track down and treat carriers, could be used to eradicate typhoid as a disease."

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## **McMurry Purchasing DNA Sequencer With Help From Grant**

*Abilene Reporter News (07/28/08) Bethel, Brian*

McMurry University in Abilene, Texas, plans to purchase a DNA sequencer, partly using money from a grant from LI-COR Biosciences. According to Dr. Gary Wilson, dean of McMurry University's school of natural and computational sciences, using such a device is "central to so many things that are happening in leading-edge industries that are going to impact the quality of life in society." The \$102,000 sequencer will be purchased in time for the fall semester, when it will be used for six different biomedical science and biochemistry courses. The device enables a researcher to input raw DNA and generate a nucleotide sequence. Wilson noted, "We all have DNA, but the sequence of nucleotides is what makes you different from me."

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## **Chemical Robot Ready for Its In-Theatre Debut**

*Shephard Group (07/25/2008)*

After three years of testing by the U.S. Army's 95th Chemical Company, a robot called the Chemical, Biological, Radiological and Nuclear Unmanned Ground Vehicle, or CUGV, is ready for deployment to Iraq and Afghanistan. The robot, part of the CBRN Unmanned Ground Reconnaissance (CUGR) concept, was previously used with explosive ordnance disposal units, says Herschel J. Deaton with Concurrent Technologies Corp.: "The CUGR (Advanced Concept Technology Demonstration) was not formed to develop new robots or detectors. Basically it was established to integrate detectors onto a robot for the purpose of helping the operational community determine if this provides military utility." According to Deaton, "The EOD community has been working with this robot for many, many years. Now they've moved up (from iRobot Corporation's PackBot 500) to a Talon, or 510 series. So the Department of Defense decided to take the robots they're not using anymore and design a detection suite so we can give the Soldier something that can go downrange and detect instead of a soldier having to get in a Level A suit." The CUGV is able to detect ammonia, chlorine, carbon monoxide, oxygen levels, volatile organic compounds and gamma radiation and will carry the new Lightweight Chemical Detector for detecting nerve and blister agents. "You can send the CUGR in, and the CUGR does the marking, and then the sampling team goes in right after that. There's less risk of human life or limb," says Capt. Julia Dorans, commander of the 95th Chemical Company. The robot's camera can enable the team to be aware of what is taking place within the contaminated area, and the camera's video can be taped from the operational control unit and relayed to higher-level commanders. "The process of testing and training done by the 95th Chemical Company here has laid the groundwork for the tactics, techniques and procedures the rest of the Army will use with the system," says Deaton.

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## **Lab-on-a-Chip at Home**

*Science Daily (07/24/08)*

University of Michigan scientists have developed a 16-piece lab-on-a-chip kit intended to help other scientists make their own microfluidic devices. The kit slashes the costs involved and the time it takes to make a microfluidic device from days to minutes, said Mark Burns, a professor in the departments of Biomedical Engineering and Chemical Engineering who developed the device with graduate student Minsoung Rhee. "This new system is almost like Lego blocks. You don't need any fabrication skills to put them together," he said. The customizable system offers six-by-six millimeter blocks etched with different arrangements of grooves that researchers can affix to a piece of glass. The block designs include inlets, straight channels, 90-degree curves, chambers, cell culture beds, connectors, and various valves, and can be used more than once. Burns believes microfluidics will eventually get smaller and more personal as technology advances, and it will enable such things as examining foods for salmonella, "analyzing yourself to see if you have influenza, or analyzing the air to see if it has noxious elements in it."

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## **Safer Blood Transfusions, Chemotherapy, Being Developed By UMass Amherst Researchers, Health Care Professionals**

*University of Massachusetts Amherst (07/22/08) Clarke, Lori A.*

University of Massachusetts Amherst computer scientists are working with healthcare professionals to analyze medical procedures, like blood transfusions and chemotherapy treatments, with the intention of improving patient safety and to analyze the flow of patients in emergency rooms to reduce waiting time. "Health care workers are dealing with new machinery and medical activities that are increasingly complex, and a 1999 report by the Institute of Medicine found that medical accidents account for almost 100,000 deaths in the U.S. each year," says UMass professor of computer science Lori Clarke. "Computers can help by detecting flaws in the processes used to deliver medical care, and confirm that efforts to fix the flaws don't create other problems down the line." One of the first procedures the team of computer scientists analyzed was a process for performing blood transfusions that is based on a national standard and is a solid representation of blood transfusion processes used at hospitals throughout the country. The procedure was selected by adverse events, including giving patients the wrong type of blood or giving blood to the wrong patient, have been reported nationally and could cause serious harm or even death. The researchers aimed to isolate flaws in the process so it could be made safer. Analysis revealed a "deadlock," detectable through software engineering techniques, which is essentially a situation where the participants would have to wait endlessly that occurs when a nurse submits a request for blood, but the blood bank needs the nurse to determine the patient's blood type first, causing both parties to wait on the other. The researchers developed technologies that identified the cause of the problem and proposed a solution, which was requiring nurses to check the availability of the blood type before notifying the blood bank. The researchers also identified a problem in chemotherapy, where doses are based on the patient's height and weight, but a patient's height and weight were measured only once at the beginning of treatment. The researchers employed software engineering tools usually used to define and analyze complex software systems, including the special language Little-JIL. The project will eventually create a suite of tools that the UMass researchers hope will be used by the Joint Commission, which accredits and certifies health care organizations.

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## **Inside View: X-Ray Microscopy**

*Chemical & Engineering News — Inside View (07/21/08) Vol. 86 , No. 29 , P. 12 ; Arnold, Carrie*

Scanning X-ray diffraction microscopy (SXDM), a new imaging method, provides scientists with a higher-resolution image of various electronic and biological samples and allows them to view specimen interiors, impossible with previous techniques. SXDM was developed at the Paul Scherrer Institut in Villigen, Switzerland, by postdoc Pierre Thibault, assistant professor Franz Pfeiffer, and their coworkers. The researchers used scanning transmission X-ray microscopy (STXM) and a high-speed detector to examine a specimen that had a concealed nanostructure. Then, they used coherent diffractive imaging (CDI) to view the X-ray diffraction patterns that resulted, which allowed them to see the specimen's nanostructure. The combination of STXM and CDI resulted in the new SXDM technique, which could be used to examine the insides of subcellular structures and superconductors.

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## **Search for Alien Life Gains New Impetus**

*Washington Post (07/20/08) P. A1 ; Kaufman, Marc*

The field of astrobiology has grown rapidly over the past decade, as scientists look for clues of extraterrestrial life. NASA's Phoenix vehicle is currently on the surface of Mars searching for organic material. The robotic lander is analyzing soil and ice in an automated lab in a search for nutrients needed to sustain life. The Mars Reconnaissance Orbiter acquired photos and other data that suggests the planet once had several wet environments that could have supported life. NASA is scheduled to launch the Kepler probe in 2009 in an effort to identify distant planets that could support life. NASA and the European Space Agency also may coordinate to probe the moons of Jupiter and Saturn.

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### **Niagara Preparing High-Tech Methods to Fight Flu Pandemic**

*Niagara Falls Review (CAN) (07/18/08) P. A3 ; Van Dongen, Matthew*

Health officials in Niagara, Canada, want to use hand-held devices and patient-tracking databases as part of its response to a potential flu pandemic. Niagara would set up a regional pandemic flu centers in St. Catharines, Niagara Falls, Lincoln, Fort Erie and Welland, and would use laptops and handhelds to register patients, record symptoms and medical history, and track treatment. Sick residents would be assessed at the five centers, which might also serve as sites for mass inoculations. Patients could register online before heading to the centers. "It means you would skip a line and be processed more quickly, like registering online for your airline boarding pass," said Dr. Jane Nassif, a project manager in the health department's pandemic planning team. And the electronic records "will follow the patient everywhere," Nassif added. Health officials tested the technology in January during human papillomavirus immunization clinics for students, and report that the pilot was promising.

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### **NIH Awards More Than \$33 Million to Fund State-of-the-Art Research Equipment**

*NIH News Release (07/16/08) McDonald, Joyce*

The National Center for Research Resources (NCRR), a branch of the National Institutes of Health (NIH), will give \$33.3 million for 20 High-End Instrumentation (HEI) grants that finance state-of-the-art research equipment. According to NCRR Dr. Director Barbara Alving, the equipment purchased through these grants is important for advancing the study of health and diseases. "High-performance equipment provides NIH-funded researchers with new discovery tools enabling a new generation of data and a new dimension of information," she said. The HEI awards will support the purchase of two nuclear magnetic resonance spectrometers, two high-powered electron microscopes, four high-resolution mass spectrometers, and several biomedical imagers, which enable noninvasive imaging on a molecular scale. In addition, the awards will be used to buy two supercomputers that can quickly process large amounts of data and two cyclotrons. One recipient, Florida State University, will purchase a robotic electron microscope that can produce rapid 3-D imaging of frozen specimens, aiding research for cancer, heart disease, HIV/AIDS, and hypertension. Meanwhile at the University of Pittsburgh, a hybrid imaging system that combines positron emission tomography with magnetic resonance imaging will help track the progression of some kinds of brain cancers and neurological conditions.

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### **NHGRI to Fund Small Molecule HTS With \$4M in '09**

*GenomeWeb Daily News (07/16/08)*

The National Institutes of Health will provide scientists with \$4 million through 2009 to develop small molecule high-throughput screening (HTS) technologies. The National Human Genome Research Institute and the National Institute of Mental Health will hand out as much as \$500,000 in direct expenses annually over two years to between five and seven researchers. The researchers are encouraged to use one of the centers in the Molecular Libraries Probe Production Centers Network to implement and test the instruments and to install one or more screens. The funding initiative has two objectives: late-stage technology development and implementing and beta-testing HTS of synthetic chemical and natural product libraries.

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### **Germany: Zwick Z050 to Test High Tensile Strengths on High-Performance Fabrics**

*Fibre2fashion.com (India) (07/11/08)*

P-D Interglas used a tensile testing machine to test the thousands of meters of glass-fiber fabric that was used to wrap around Zenith Arena in Strasbourg, France. Engineers wanted to wrap the arena in 15,000 square meters of material, but they needed to make sure it would not break. The Zwick Z050 machine they used can test tensile strength of up to 11,000 pounds and can be used on sensitive material, including tissue paper and high-performance fabrics. The machine features Zwick's testXpert software, which contains a Laboratory Information Management System. The database can administer test results from a number of test series, and the software can be used to create custom tests.

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## **Bedside Tests Can Speed Results, Ease Crowded ERs**

*Tennessean (07/09/08) Ward, Getahn*

Three months ago, the Middle Tennessee Medical Center purchased equipment that allows physicians to conduct blood tests at the patient's bedside. The equipment reduced the time it takes to get test results from about 1.5 hours to just minutes, enabling quicker treatment and the continuation of subsequent tests like X-rays. The medical center intends to add pregnancy and urine tests that can be conducted at the bedside as well. The move indicates a rising trend to point-of-care testing that experts say could help reduce emergency room congestion. Technology improvements have allowed testing units to become smaller and less expensive.

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## **Miniaturised Scanner Zooms in on Disease**

*New Scientist (07/08/08) Jason Palmer*

U.S. scientists have constructed a handheld nuclear magnetic resonance (NMR) scanner that could assist in identifying diseases and pathogens. Traditionally, NMR machines use powerful magnets to align nuclei, after which they send radio waves that causes a movement known as precession. Precession sets off currents in a coil near the nuclei, and these currents are used to discover the chemical structure of the nuclei's molecules. Ralph Weissleder of Harvard Medical School and colleagues determined that magnetic nanoparticles produce a greater signal than single nuclei. By coating the nanoparticles with molecules that attach to certain biomolecules, weaker magnetic fields can be used to identify pathogens with a sensitivity 800 times that of conventional NMR scanners.

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## **Soft, Squishy Robots Can Change Shape, Size**

*Computerworld (07/08/08) Gaudin, Sharon*

Tufts University scientists are developing soft, squishy robots that are able to squeeze through tight spaces and then return to their original size and shape. Tufts professor Barry Trimmer says creating soft robots could lead to a new way of approaching robotics. He says such robots could use biological materials such as silk proteins to make muscles and sensory organs. They could be used for detecting land mines or for search-and-rescue efforts in hazardous areas. Trimmer says the robots would be like an octopus, which can radically change its shape and compress itself down to the size of its eyeball. "We have no idea how to do that yet, but this project is trying to understand the technology that is needed to do that," he says. Researchers have spent a significant amount of time studying the caterpillar, which can control its body with a relatively simple nervous system despite its lack of bones or joints. The caterpillar is particularly interesting because it can move itself with only two muscles controlling each leg because of the way its body responds to the simple contraction and release of muscles. Soft robots would be controlled by tiny, flexible computer chips. "If you look at a soft-bodied animal, in a traditional engineering approach, you'd expect to use more computation to control it," Trimmer says. "It should have a bigger brain, but you don't see that."

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## **Get Lean, Get Automation, Get Help**

*Control Engineering (07/01/08) P. 31*

Experts offered engineers numerous tips about automation at "A Passion for Manufacturing, 2008 SME Annual Meeting & Interactive Conference" in Detroit last month. Dr. Raul Fernandez of Automated Manufacturing & Assembly said automation and robotics should be a priority for manufacturers once they implement lean initiatives. He noted that robotics offers better mean time between failure than some machine tools and pieced-together systems and that robots make sense when more than two axes must be integrated. Cincinnati Inc. President and CEO Dennis Bray echoed Fernandez's comments by stating, "We're producing highly complex parts at speeds of 10 to 30 parts per minute, which would be very costly to do by traditional machining techniques. Automation helps make the pressure of faster lead times and lower batch sizes possible." Additionally, Bonnie Knopf of Intrepid Plastics underscored the importance of local Manufactured Extension Partnerships in reducing manufacturers' expenses, boosting top line growth and operations, and enhancing processes, among other things.

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## Automating DNA Isolation From Cereal Crops With Tecan's Magnetic Bead Technology

Centre Daily Times (PA) (07/01/08)

In an effort to genetically characterize local cereal landraces, Italian researchers are conducting microsatellite marker analysis. To that end, the researchers, from the Research Centre for Agriculture and Forestry Laimburg in Northern Italy, have created a partially automated process to extract and isolate high-quality DNA from cereal crops. "The semi-automated magnetic bead-based separation procedure that we have established with the TecMagS has at least doubled our throughput and more than halved the manual labor time compared to conventional cetyl-trimethylammonium bromide-based protocols," explained Sanja Baric, head of the Molecular Biology Section at the research center.

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*"That's Dr. Arnold Moore. He's conducting an experiment to test the theory that most great scientific discoveries were hit on by accident"*