Laser yields powerful 3-D images of retina

New visualization methods could improve early diagnosis of disease

Elizabeth Thomson
News Office

In work that could improve diagnoses of many eye diseases, MIT researchers have developed a new type of laser for taking high-resolution, 3-D images of the retina, the part of the eye that converts light to electrical signals that travel to the brain. The research will be presented at the Conference on Lasers and Electro-Optics and the Quantum Electronics and Laser Science Conference in Baltimore on May 10.

The new imaging system is based on Optical Coherence Tomography (OCT), which uses light to obtain high-resolution, cross-sectional images of the eye to visualize subtle changes that occur in retinal disease. OCT was developed in the early 1990s by MIT Professor James Fujimoto, Eric Swanson at MIT Lincoln Laboratory and collaborators; Fujimoto is an author of the report to be presented in May.

“Within the last few years optical coherence tomography has become a standard diagnostic for ophthalmology. New techniques are now enabling dramatic increases in image acquisition speeds. These advances promise to enable new and powerful three-dimensional visualization methods which could improve early diagnosis of disease and treatment monitoring,” said Fujimoto, who holds appointments in MIT’s Department of Electrical Engineering and Computer Science and the Research Laboratory of Electronics.

Conventional OCT imaging typically yields a series of two-dimensional, cross-sectional images of the retina, which can be combined to form a 3-D image of its volume.

Systems biology, in search of a metaphor, tries out language of machines, intestines

Robin H. Ray
News Office Correspondent

Sociology professor Joan Fujimura, visiting MIT from the University of Wisconsin at Madison, discussed her recent work at a Program in Science, Technology and Society (STS) colloquium on April 25. Formerly a specialist in anthropology at Stanford, Fujimura has since focused her attention on the sociology of science, particularly notions of nature/culture and science/society in the fields of genetics, bioinformatics and systems biology in the United States, Europe and Japan.

“One of the emphases in my frame,” said Fujimura, “is to use ecological understanding from symbolic interactionism in my research,” and she feels that “systems biology mirrors a lot of the kind of theorectical and methodological problems that we have in STS.” As she noted, “Our problem”—in STS as much as in systems biology—“is how to represent complexity and still say something interesting and coherent.

Systems biology is a rapidly changing field, one that even its practitioners cannot define to mutual satisfaction. “They are explicit about their ontological problems,” Fujimoto said. Some scientists use the term “systems biology” loosely to apply to projects exploring individual biological networks. Others see it as an outgrowth of...
ALZHEIMER’S

Continued from Page 1

a Howard Hughes Medical Institute investigator. “This hints at the possibility that cognitive function can be improved even in advanced stages of dementia.”

What’s more, the researchers’ results help explain why even severely afflicted patients are occasionally lucid.

Master regulators

Tsai’s team was also able to mimic the effect of living in an enriched environment by treating the Alzheimer’s-like mice with histone deacetylase (HDAC) inhibitors. HDACs are a family of 11 enzymes that seem to act as master regulators of gene expression. Drugs that inhibit HDACs are in experimental stages and are not available by prescription for use for Alzheimer’s diseases in advanced stages of dementia.”

No End in Sight

“Tsai’s laboratory developed a transgenic mouse in which expression of p25, a protein implicated in various neurodegenerative diseases, can be switched on or off with a change in diet. Mice that expressed the p25 protein had significant loss of brain cells and acted as though they did not remember tasks they had previously learned. It’s not clear if memories were simply lost or became inaccessible due to synaptic plasticity and neuronal loss,” wrote Tsai. “In the latter case, it might be possible to reestablish the access to such memories if sufficient refinement of the neuronal network can be achieved by the remaining neurons.”

In 2003, a man who was barely conscious for nearly 20 years regained speech and movement at a Mountain View, Ark., rehabilitation center. Last year, doctors

Earth day

This bale of aluminum soda cans and other containers was outside Stata to remind people to recycle.

Broad Institute will screen ‘No End in Sight’

“No End in Sight: The American Occupation of Iraq,” a film directed by Charles Ferguson, visiting scholar at MIT’s Center for International Studies, will be screened for the public in the auditorium of the Broad Institute of MIT and Harvard on Wednesday, May 2, at 6 p.m.

“No End in Sight” won a special jury prize at the 2007 Sundance Film Festival, held in Park City, Utah. The screening, to be followed by a discussion with the director, is sponsored by the MIT Center for International Studies’ Starr Forum.

“No End in Sight” analyzes Iraq’s descent into guerrilla war, warlord rule, criminality and anarchy. Based on more than 200 hours of footage, the film retells the events following the fall of Baghdad in 2003 through interviews of such high-ranking officials as former Deputy Secretary of State Richard Armitage, Ambassador Barbara Bodine (who was in charge of Baghdad during the spring of 2003), Lawrence Wilkerson, former chief of staff to Colin Powell, and General Jay Garner (who was in charge of the occupation of Iraq through May 2003), as well as Iraqi civilians, American soldiers and prominent analysts.

Ferguson received his B.A. in mathematics from Berkeley and his Ph.D. in political biology from MIT. The author of three books, he has been a senior fellow at the Brookings Institution and a visiting scholar at MIT and Berkeley, and he is a life member of the Council on Foreign Relations.

The Broad Institute is at 7 Cambridge Center (corner of Main and Ames streets). Please RSVP to nhuch@mit.edu.

AWARDS AND HONORS

Professor Ian Waitz has been named the first Hunsaker Professor of Aeronautics in the Department of Aeronautics and Astronautics. The appointment enables the professor to “make, or continue to make, contributions at the forefront, or important fields of aerospace sciences.”

The chair is named for Jerome Hun- saker, aeronautical engineering graduate who founded the department as the first aeronautics and aircraft engineering program in the United States. Waitz continues Hunsaker’s pioneering aviation spirit with his work in propulsion, fluid mechanics, thermodynamics, reacting flows, aeroacoustics and, in particular, aspects of these disciplines that relate to environmental issues associated with air-craft design and operation.

Waitz is the director of the Partnership for Air Transportation Noise and Emissions Reduction, an MIT-based leading aviation cooperative research organization sponsored by the Federal Aviation Administration, NASA and Transport Canada.

Submit awards for commencement issue

Tech Talk will publish the 2007 awards issue in print and online on June 6. The annual special section lists the names of winners of annual awards, by department, along with photographs where available. Names of award winners must be submitted to Tech Talk by 5 p.m. on Thursday, May 10, in order to be included in the awards issue. Please note: Do not submit Infinite Mile Awards or awards from outside organizations.

All submissions to the awards issue should be made online at web.mit.edu/newsoffice/awards.html. All photographs must be e-mailed to shwright@mit.edu. Please clearly identify the subjects and include the name of the photographer.

To see the 2006 Awards issue, please go to: web.mit.edu/newsoffice/2006/awards-index.html.

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MIT, IBM team up on first PlayStation® course

MIT’s Department of Electrical Engineering and Computer Science and IBM have announced the completion of the first column in the United States struc-
tured around the capabilities of the Cell Broadband Engine (Cell/B.E.), a micro-
processor that powers the new PlayStation®3 computer entertainment system.

During the four-week Independent Activities Period course in January, stu-
dents, who already learned about the microprocessor, designed and imple-
mented projects to run directly on Play-
station®3. One group of MIT student teams have been awarded a robust toolchain for Cell development," said Amarasinghe.

The Cell Broadband Engine is going to be an underlying architecture that has the potential to be included in a wide range of industry applications and solutions in the future," said Rahbar. "This course was able to break down the details of a highly complex microprocessor and challenge students to see where the performance, power and versatility could be applied out-
side of gaming. Based on the feedback we received from the students, it was a tremendous success."

A web site hosted by the Computer Architecture Group at MIT posts informa-
tion on the course, including lectures and recitation plans. It has been visited more than 100,000 times since the completion of the course.

IBM and the Department of Electrical Engineering and Computer Science, with sponsorship from Sony, plan to jointly offer the course again in 2008. More information can be found at cag.csail.mit.edu/

Quarter Century Club induction will be held May 8

The MIT Quarter Century Club induc-
tion ceremony and luncheon for new members will be held May 8 on Tues-
day, May 8. New membership in the club is offered to the faculty, administrative, research, support and service staff who will celebrate their 25th anniversary with the university this year. If you believe you are eligible for member-
ship but have not received an invitation to attend the induction luncheon, please contact the Quarter Century Club in the Community Services Office at 73-7914 or twarts@mit.edu.

Eureka! Lemelson-MIT and Museum of Science host celebration of inventors and inventions

The Lemelson-MIT Program, in part-
nership with the Museum of Science, Bos-
ton, kicks off EurekaFest, a midday cel-
bration of activities to fuel the inventive spirit today.

EurekaFest events will be held May 25 at MIT and the Museum of Science. Most events are open to the public.

The best project—a 3-D version of the clas-
sic video game Tetris, developed by students and discussed at the Game Developer Conference in March.

The course, which focused around introducing parallel programming to stu-
dents, was taught by Timothy Swager, a professor in MIT’s Department of Elec-
trical Engineering and Computer Science, and Robust Rahbar.

"The fact that students—with no back-
ground in parallel programming or the
Cell Broadband Engine—were able to get their projects done from scratch in just about one month largely goes to show how capable and determination of our students, coupled with the availability of a robust toolchain for Cell development," said Amarasinghe.

Throughout the course, students
became familiar with the Cell/B.E. and
how its design choices compare to other
parallel architectures. The group pro-
moted itself as "The Windy 500," an engineering design challenge created to "drive" interest and enthusiasm among more than 150 Mas-
sachusetts high school students and their teachers.

These students had access to the power of the Cell/B.E. and could
apply its power and versatility in a variety of ways.

"We are very pleased to collaborate with the Lemel-
som/MIT Program. The hands-on engineer-
ing activities, combined with special guest instructors, are a perfect complement to the museum’s programs," said Miasolis.

One highlight event of EurekaFest is "The Windy 500," an engineering design challenge created to "drive" interest and enthusiasm among more than 150 Mas-
sachusetts high school students and their teachers.

Student teams will collaborate on a sur-
prise project with science and engineering mentors in a race against time and each other. Tom and Ray Magliozzi, aka Click and Clack, the hosts of "Car Talk" from National Public Radio, also will be on hand to declare one team the victor of "The Windy 500."

"EurekaFest will also include your favorite MIT professors and technical assistant Matthew Dobbin set out to see if they could boost the plasticity—the ability to change—and the function of the animals’ remaining neurons.

The fact that long-term memories can be recovered by environmental enrich-
ment or elevated histone acetylation sup-
ports the idea that apparent memory loss is really a reflection of inaccessible
memories, ’in which demented patients experience temporary periods of apparent clarity,’” said Tsai. "These findings are in line with a phenomenon known as ‘shoc-
tuating memories,’ in which demented patients experience temporary periods of apparent clarity.”

Tsai said, "We really hope that our results will lead to a suitable therapeutic approach to treat dementia. However, the immediate next steps are to determine which HDAC’s regulate distinct forms of synaptic plasticity, learning and memory."

This work is supported by the National Institutes of Health.

MIT graduate student Nathan Ball, who invented a device for rapidly scaling large heights, is this year’s winner of the $30,000 Lemelson-MIT Student Prize.

MIT Tech Talk

May 2, 2007

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EYE IMAGING

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The system works by scanning light back and forth across the eye, measuring the echo time of reflected light along micrometer-scale lines that, row by row, build up high-resolution images.

Commercial OCT systems scan the eye at rates ranging from several hundred to several thousand lines per second. But a typical patient can only keep the eye still for about one second, limiting the amount of three-dimensional data that can be acquired.

Now, using the new laser, researchers in Fujimoto’s group report retinal scans at record speeds of up to 230,000 lines per second, a factor of 10 improvement over current OCT technology.

Future clinical studies, as well as further development, may someday enable ophthalmologists to routinely obtain three-dimensional OCT images of the eye, containing comprehensive volumetric information about the structure of the retina. Such snapshots could potentially improve diagnoses of retinal diseases such as diabetic retinopathy, glaucoma and age-related macular degeneration.

Fujimoto’s colleagues on the work are Robert Huber, a visiting scientist at MIT now at the Ludwig-Maximilians University in Germany, Desmond C. Adler and Vivek Srinivasan. Adler and Srinivasan are both graduate students in EECS.

The current research was sponsored by the National Science Foundation, the Department of Energy, the Force Office of Scientific Research.

Mitchell portrays MIT campus design process

Deborah Halber
News Office Correspondent

Early explorations of what would eventually become the Ray and Maria Stata Center included crumpled pieces of paper, piles of toy-like wood and plexiglass blocks and something resembling a mass of discarded tin foil.

These were not designs, exactly, but provocative attempts by architect Frank Gehry to get the diverse group of MIT clients and the future inhabitants of the building to start to think about what they really wanted—to react, directly and emotionally, to the propositions on the table before them.

The stories behind the conceptual design and construction of the Stata Center and four other major buildings—Kevin Roche’s Zeiger Sports and Fitness Center, Steven Holl’s Simmons Hall, Charles Correa’s Brain and Cognitive Sciences Complex and Fumihiko Maki’s new project for the Media Laboratory—contain a rich history of three-dimensional social forces and ends, and the means to try to meet great buildings out of all that.”

Mitchell, by including pictures of drawings, played a pivotal role in securing MIT’s new NAE leadership role.

Vest is elected NAE president

He will deliver MIT’s Commencement address

President Emeritus Charles M. Vest has been elected to a six-year term as president of the National Academy of Engineering, effective July 1.

“Engineering is at the core of addressing fundamental challenges to the U.S. economy, environment, health, security, and way of life in the 21st century,” Vest said in an April 26 statement in the future of the National Academy of Engineering (NAE).

“As an independent organization of nearly 2,000 of the nation’s most accomplished engineers charged to provide the federal government with objective, informed advice on technical matters, the NAE can and will play an important role in securing our nation’s future,” Vest wrote.

Vest will deliver the 2007 Commencement address at MIT, assuming his new NAE leadership role.

The NAE is part of the National Academies, which also include the National Academy of Sciences, Institute of Medicine and National Research Council. These independent, nonprofit institutions serve as advisers to government and the public on issues related to science, engineering and medicine. NAE’s membership consists of the nation’s premier engineers, who are elected by their peers for their distinguished achievements.

The NAE president is a full-time employee of the organization at its headquarters in Washington, D.C., and also serves as the vice chair of the National Research Council, the principal research arm of the National Academies.

Vest served as MIT’s president from 1980 through 2004, where he “worked to strengthen federal university-industry relations and undertook a number of initiatives to bring education and research issues to broader public attention,” according to the NAE.

Selected as a member of the bipartisan Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction, which completed its report in 2005, Vest brought a strong science and engineering background to the analysis. He led a U.S. Department of Energy task force on improvement of science programs in 2002-2003 and chaired a presidential advisory commission on the redesign of the Oak Ridge National Laboratory in 1992-1994. Vest was vice chair of the Council on Competitiveness for eight years, is a former chair of the Association of American Universities, and serves on the U.S. Secretary of Education’s Commission on the Future of Higher Education.

Vest was elected to the NAE in 1993, “for technical and educational contributions to holographic interferometry and leadership as an educator,” and he currently serves on the NAE Council.

Vest earned a B.S. degree in mechanical engineering from West Virginia University in 1963. He received his M.S. and Ph.D. degrees in 1964 and 1967, respectively, from the University of Michigan, where he later had a distinguished career in engineering, provost and vice president for academic affairs. He is the recipient of 10 honorary doctoral degrees.
New MIT technique weighs single living cells

One promising application is creation of a cheap and robust device to monitor CD4 cell numbers in AIDS patients

Akalu Tefera

MLK professor teaches ‘excitement’ of solving math—and life—problems

Deborah Halber

For the first time, MIT researchers have found a way to measure the mass of single cells with high accuracy.

The new technique, which is based on a micro-mechanical detector, could allow researchers to develop inexpensive, portable diagnostic devices and might also offer a unique glimpse into how cells change as they undergo cell division.

Unlike conventional methods, the MIT technique allows cells to remain in fluid while they are being measured, opening up a new realm of possible applications, says Scott Manalis, senior author of a paper on the work that appeared in the April 26 issue of Nature.

In addition to weighing cells, the technology can be used to “weigh nanoparticles or submonolayers of biomolecules with a resolution in solution that is six orders of magnitude more sensitive than commercial mass sensor methods,” said Manalis, an associate professor in MIT’s Departments of Biological Engineering and Mechanical Engineering.

Current mass-measurement methods achieve a resolution down to a zeptogram (10^-21 grams) but only work with nonliving things because the procedure must be performed inside a vacuum. So, the MIT researchers decided to turn the conventional system inside out.

In the traditional method, the molecules to be weighed are placed on top of a tiny slab, or cantilever, made of silicon. The slab vibrates at its resonant frequency (the frequency at which the material naturally tends to vibrate) inside a vacuum. When a molecule sits on the slab, the frequency changes slightly, and the mass of the molecule can be calculated by measuring that change.

This measurement must be performed in a vacuum to prevent air from blowing the cantilever off course and interfering with the frequency of oscillation. However, cells cannot survive in a vacuum, so the MIT researchers decided to turn the conventional system inside out.

For example, a hollow, fluid-filled guitar string, vibrates with a frequency (tone) of the vibration. Red bacteria, flow through it. As the particles pass through, they undergo cell division.

The researchers solved this dilemma by placing the fluid containing the sample inside the silicon slab, which still oscillates within a vacuum surrounding it. The biological sample is pumped through a micro-channel that runs across the slab, without impairing its ability to vibrate.

“The resonator is sealed in a tiny vacuum cavity inside the chip, so there is virtually no resistance to the vibration,” said co-lead author Thomas Burg, a research associate in biological engineering.

“This lets us measure a mass change, say 10 parts in a billion, of the already very light microcantilever.”

So far, the researchers have weighed particles with a resolution down to slightly below a femtogram (10^-15 grams), but Manalis believes that with refinements, the sensitivity could potentially be lowered by several orders of magnitude within a few years. “Every step along the way will open up new possibilities,” he said.

The researchers can also measure the mass density of particles or cells “by varying the density of the surrounding solution,” said Michel Godin, co-lead author and postdoctoral associate in biological engineering.

The research team is already looking into several applications for the new technique.

One area of great promise is creating a device that would mimic the cell-counting capabilities of flow cytometers, which are often used to monitor CD4 cell numbers in AIDS patients. By counting CD4 cells, a type of immune cell, doctors can tell how far a patient’s AIDS has progressed. However, flow cytometry devices, which work by bouncing light off a flowing stream of cells, are too large and expensive to be useful in developing countries where many AIDS patients live.

A tiny chip that could count cells using the new MIT weighing method would be a “cheap and robust” alternative to commercially available flow cytometers, which typically cost more than $20,000, Manalis said.

“Since the device is batch-fabricated by conventional semiconductor processing techniques, it could potentially be used in a more economical manner than flow cytometry,” he said.

William Rodriguez, an AIDS researcher at Massachusetts General Hospital who is familiar with Manalis’ research, said the new technology could have a tremendous impact on AIDS testing in rural areas of Africa.

The researchers can also measure the friction between particles or cells, which can then be used to determine the density of the surrounding solution. For example, if a device measures the friction between particles and a fluid, which diminishes the accuracy of the measurement, it can be used to determine the density of the surrounding solution.

In addition to the potential for creating new medical devices, the MIT researchers believe the technology could also be used to count living cells in small amounts of fluid, such as blood samples.

The researchers also conducted an experiment to determine the density of the surrounding solution and the mass of a cell. They measured the frequency of the vibration of a single particle, and then calculated the mass of the particle.

The MIT researchers have developed a tiny chip that can be used to weigh single cells or particles. As particles flow through the device, the frequency of vibration of the cantilever (green) is slightly altered, allowing the mass of the particles to be calculated.

MLK professor teaches ‘excitement’ of solving math—and life—problems

Anne Trafton

In the small southern Ethiopian town where Akalu Tefera grew up, mathematics and physics textbooks were scarce. High school students who were as inspired by their teachers as he was borrowed their textbooks.

Tefera, who has been named a Martin Luther King Jr. Visiting Professor for 2006-2007, now passes along his love for mathematics and physics to his students in Ethiopia—and has helped his classmates in Ethiopia—and has mentored undergraduate students in Ethiopia.

Despite the fact that Tefera did not attend one of the elite private schools in the capital, he did manage to “pass through the needle’s eye” as one of only a few thousand students to pass the rigorous exam for admission to Addis Ababa University, where he earned undergraduate and graduate degrees. He earned his Ph.D. degree from Temple University.

Tefera, associate professor of mathematics at Grand Valley State University in Allendale, Mich., specializes in the branch of mathematics called combinatorics, which studies collections of objects that meet certain criteria. An example of a combinatorial problem is: What is the number of possible ways to order a deck of 52 playing cards? The answer involves multiplying 52 digits and arriving at a number 80 digits long.

Besides solving problems, combinatorics is about theory building.

Tefera works on software that facilitates mathematical expressions in symbolic form. His work in computer algebra has resulted in software packages that have useful applications in mathematics, in particular, to computer-aided discovery and proof of combinatorial and integral identities.

“Research and exploration of algorithmic techniques used in computer-aided discovery and proof of mathematical theorems has been gaining a lot of momentum over the past decade,” he said. “Some mathematical problems involve determining the number of different ways certain things can be done and finding a simple formula for doing so.

“An elegant algorithmic checking procedure. For example, in the summer of 2005, I helped a student study a special class of sums and summation algorithms. Using these algorithms cleverly, the student was able to solve challenging and new problems that involve combinatorial identities,” he said.

Tefera is energized by working with undergraduates. “I believe an exciting undergraduate research project is a key factor for cultivating and retaining student interest in pursuing advanced studies in mathematics,” he said.

“I also like to work on research problems that stem from my classroom teaching experience and that enhance my classroom teaching,” he said. “For example, I have questions based on students’ mathematical mistakes and misconceptions, such as, ‘We know that this does not work in general, so for what class of objects does it work? Can we characterize those objects for which this generally wrong statement will be true?’

While it may seem counterintuitive to dwell on mistakes, Tefera has found that mistakes have led to interesting problems.

“The research problems and results are very interesting and exciting,” he said.

In the summer of 2005, I helped a student study a special class of sums and summation algorithms. Using these algorithms cleverly, the student was able to solve challenging and new problems that involve combinatorial identities,” he said.
Bonvillian wins IEEE public service award

A stalwart supporter of federal R&D programs

William B. Bonvillian, director of the MIT Washington, D.C., office and a former legislative director and chief counsel for Sen. Joseph Lieberman (IConn), has been presented with a 2006 Distinguished Public Service Award by the Institute of Electrical and Electronics Engineers (IEEE/USA) “for outstanding support of science and technology legislation and policy in the U.S. Congress.”

Bonvillian, now a principal at Stout, Ross & Co. in Alexandria, Virginia, currently is a scholar-in-residence with the Woodrow Wilson School of Public and International Affairs at Princeton. He plans to share the Distinguished Public Service Award with MIT.

“Their support for investment in high-tech research and development (R&D) has helped to boost U.S. competitiveness and contributed greatly to our nation’s innovation enterprise,” IEEE/USA President John Meredith said.

“This helps U.S. engineers thrive in an increasingly competitive global environment,” he said.

Bonvillian will join 17 award recipients to be honored during the IEEE-USA annual meeting in Scottsdale, Ariz., in September. According to award materials, Bonvillian has been a “ stalwart supporter of federal R&D programs since his tenure in the Department of Transportation, (1985-1988). He is credited for developing a wide array of initiatives for Lieberman, including the Clean Air Act (1990); the Technology Talent Act (2001); the Homeland Security Act; the NASA Act; the National Nanotechnology R&D Act (2003); and the National Innovation Act (2005), among others.

IEEE/USA award recipients are recognized for their professionalism and technical achievements, as well as literary contributions to the progress and advancement of the engineering profession in the United States.

Classified Ads

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Africa and elsewhere. Simply put, a cheap, simple CD4 counter could save a community health worker...would be a breakthrough advance in global health, according to the National Institute of Allergy Angela Anon, who is interested in studying how the mass density of a single cell goes through cell division. Using the new method, scientists can ultimately map a single cell and observe it over a long period of time. Changes in mass could correlate to production of proteins and organelles. This characteristic of what the cell does during division, Manalis said. Apply the new technology to measure small particles, or beads. It’s important to know the size of particles used in the field when making measurements and determinations, and the different sizes of materials, said Manalis, who added that the new technology could become the “gold standard” way to measure these particles one by one.

Other authors on the Nature paper are Scott Knauft, MIT postdoctoral associate in biological engineering; Wenjing Shen, Georgia Tech; and a research fellow of Innovative Micro Technology in Santa Barbara, Calif. The work is coupled of Innovative Micro Technology and Affinity Biosensors in Santa Barbara.

The research was funded by the National Institutes of Health Cell Decision Project Program, the National Research Council Biotechnologies from the U.S. Army Research Office, the Air Force Office of Sponsored Research, Massachusetts State University and the National Science and Engineering Research Council of Canada.

HORVITZ Continued from Page 1

Medical investigator, delivered the 35th annual Killian Award lecture April 24 to 27. Winner was James R. Kil- llian Jr. Faculty Achievement Award. Horvitz spoke on “Worms, Life and Death; Cell Death in Development and Disease.”

Horvitz is concerned that because of decreasing research support, young researchers will not have the same freedom he did to pursue basic research. “Basic science may lead not only to inven- tionally stimulating findings, but also to major insight of a practical nature,” he said. “Basic research must be supported outside the private sector by governments and foundations because discoveries in basic research can act on a basis that will benefit humanity but cannot possibly constitute a profitable enterprise.”

The current downward trajectory of government support for basic research is “a profound concern,” Horvitz said. It underestimates the rate of inflation in the cost of doing bio- medical research. Six to 8 percent annual increases are needed simply to maintain the current level, he said, while 10 to 12 percent increases are needed to “propel biomedical research to take advantage of current knowledge.” He said that for the 1 percent increase over the past few years has not been enough. “To maintain progress in the future, government-funded basic science,” he said.

Horvitz has identified many genes involved in signaling pathways that correlate directly to human development and disease. In the roundworm, there are 131 cells generated during development that are not found in the adult because they die through normal programmed cell death. Biologists used to think that only old or damaged cells died off, but researchers now know that cell death is “an active process, governed by specific pathways,” Horvitz said.

Cells die in many scenarios—tadpoles lose their tails as they turn into frogs, and webbing between the fingers of humans in utero is sculpted out by programmed cell death. “We believe--cells don’t have to go right, it can also go wrong. Many disorders stem from a disruption in the perfect equilibrium between cell birth and cell death,” he said. Some, like cancer, involve too little cell death. Some, like neurodegenerative diseases, involve too much.

The Horvitz laboratory has identified genes and proteins involved in the first step genetic pathway of cell death and division. The human counterparts of the roundworm gene products are potential therapeu- tic targets in a broad range of diseases. “If we could inhibit a killer gene, we could prevent the pathological process of pro- grammed cell death and cause dying cells to survive.” Horvitz said. For diseases involv- ing too little cell death, such as cancer, if we could activate the cell death pathway, we should be able to cause cells to die that have otherwise escaped death.

Horvitz is director of a biotechnology company Horvitz founded 3 years ago called SomaLogic. Horvitz is working to develop a technology to measure protein quantity and expression volumes in patients.

Established in 1971 as a tribute to MIT’s 10th president, the Killian Award recognizes research or professional accomplishments by an MIT faculty member. The winner delivers a lecture in the spring term.

Wealthy Wandel L N or bus. New bath “(S), roof (S), deck (S), swing set (S), fenced yard. Kitchen, hardwoods, workshop. $359,9K, jscschrock@comcast.net.

Housing

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FOR SALE

HORVITZ

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Wealthy Wandel L N or bus. New bath “(S), roof (S), deck (S), swing set (S), fenced yard. Kitchen, hardwoods, workshop. $359,9K, jscschrock@comcast.net.

Housing

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Weymouth Landing T or bus. New bath “(S), roof (S), deck (S), swing set (S), fenced yard. Kitchen, hardwoods, workshop. $359,9K, jscschrock@comcast.net.

FOR SALE

HORVITZ

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The Horvitz laboratory has identified genes and proteins involved in the first step genetic pathway of cell death and division. The human counterparts of the roundworm gene products are potential therapeu- tic targets in a broad range of diseases. “If we could inhibit a killer gene, we could prevent the pathological process of pro- grammed cell death and cause dying cells to survive.” Horvitz said. For diseases involv- ing too little cell death, such as cancer, if we could activate the cell death pathway, we should be able to cause cells to die that have otherwise escaped death.

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Kenyan center supports literacy, development

Aisha Walcott, a graduate student in electrical engineering and computer science, recently traveled to Laare, Kenya, as a representative of the MIT Global Outreach program, which was funded by a grant from the MIT Public Service Center.

Her mission was to teach educators and other residents of the small rural village how to use computers to help in place strategies for sustaining the technology center and to ensure that it had the greatest impact on the community.

Walcott admits that as a member of the MIT Global Outreach program, she had been exposed to the small classroom and home situations and had learned how far behind the country lags in technology. Walcott referred to as its initial stages. Walcott prepared a curriculum geared toward teachers who had some experience working with computers, but she was not prepared for the lack of computer furniture. One training manual is used to instruct classes of 10 to 15 students.

The center was founded in 2005 through the efforts of Eric Mbiuki, an MIT alumnus originally from Laare, and the MIT Public Service Center. It was one of the first projects taken on by the CSAIL Imara outreach program. It was founded to teach the local community awareness and literacy of Laare residents by providing accessible and inexpensive training on the use of computers.

Since the center began to operate in 2005, more than 2000 professional and personal computer lessons have been taught to 10 computers, helping a large number of them find better employment as teachers, clerks and technicians in local institutions and businesses. It has also made it easier for some of the students to get into more advanced computer courses in other technical colleges in the region.

The center is still in its early stages, and Walcott knew that she was going to an area where people had very little experience working with computers. She also knew that very few of them had had computers before, and she knew how little experience the teachers sent by the local primary schools had with computers.

Initially Walcott and her colleague, Shannan Hines, an MIT graduate student, asked the schools to send teachers who had some experience working with computers. With this in mind, Walcott prepared a curriculum geared toward teaching the teachers the basics of the computer and basic computer hardware.

At Walcott's first lesson with the teachers, she became apparent that none of the teachers had any prior experience with computers, and the class would not be following the curriculum that she had designed. Instead, she adapted her curriculum "on the fly" to include topics ranging from proper care of the computers to basic operation of the hardware.

 Rather than getting frustrated by this experience, Walcott embraced the challenge and praised the teachers for their willingness and ability to thrive with minimal direction, and particularly their desire to learn.

In parallel with the growth of the program in Laare, Walcott underwent a personal growth of her own.

"You only live once. I want to make it count," she said of her contribution to humanity as possible. The most natural way for me to contribute is through my passion for teaching," she said. By working with the Laare community, Walcott and other participants in the CSAIL Imara program have empowered residents to affect change in their community through computer technology.

A program that gives Saudi women a SWIFT start in technology

WIT through Women Initiative For Technology, or WIT SWIFT, is a SWIFT start in technology. This program is designed to empower women in Saudi Arabia to teach Saudi women basic computing and IT skills. WIT's goal is to empower women to teach Saudi women basic computing and IT skills. WIT supports receive from Microsoft Unlimited Potential curricula and instructor training and also has partners in Iran, Kuwait, Oman, United Arab Emirates and Yemen.

"I wanted to do a project that’s good for society and the school," she said. So she helped the students organize their own nonprofit company within the school. This gave the students real-world experience and also allowed the school to use the connection. The students named the enterprise Student Women Initiative For Technology, or SWIFT.

Hashmi assisted the students in determining a SWIFT hierarchy with a president, vice presidents, and departmental representatives such as marketing, human resources, finance and IT. The students then interviewed potential customers, and she would be selected for the program.

WIT SWIFT trains the students to become Microsoft certified. These women then taught the entire Microsoft curriculum in the small offices of the Internet and e-commerce, to other Saudi women.

Hashmi said one of the most exciting parts of the project was that the program taught the young women a sign of a new reality. "I wanted to go through finance to raise and raise funds and had to deal with a president and a vice president," she said.

The project won the first runner-up prize in the Jeddah Economic Forum Colloquium in 2007. Hashmi was in the United States for the SDG program and was formally invited to mentor students. When asked what was most satisfying about the project, she said, "working with the students and watching them change and grow." The project is in computer science and math from Washington College and an M.A. in computer science from the University of California in Santa Barbara. Her work led to Saudi Arabia, Hashmi envisions continuing this initiative with similar projects. "Education is a liberation factor. With education, you can empower yourself," Hashmi said.

"WACK!" weighs the impact of feminist art

"WACK! Art and the Feminist Revolution," published by MIT Press to accompany an exhibition of the same name, inspires challenges to the way we think about the impact of feminist art movements. The exhibition, originating in Los Angeles, is a collection of art produced by women during the 1960s and 1970s, with the purpose of the exhibition's catalogue is to rouse discussion about both the impact of the feminist art movement and the need to re-examine the movement today. The book and the exhibition are ambitious, confrontational and far-ranging in scope.

The WACK exhibition, based in Los Angeles and curated by Comissioned Contemporary Art, was proposed and curated by Cornelia Butler. It is the first ever exhibition of work entirely by women artists; its level of ambition, commitment and organization has been achieved by a glance at the page listing leaders to the exhibition—18 strong, many of the artists themselves.

The catalogue includes not only full-color, high-quality plates, but also short biographies of each artist or collective and essays by respected art history scholars. The attention to design is evident from the arresting wraparound cover image depicting Marina Abramovic's "Body Beauliful," or Beauty Knows No Pain. Hot House or Harem," a tangle of women's bodys (this and the narrow column of women's names are chosen carefully to avoid the tendency to shock."

Ironically, considering the international flavor of the show, the American artists included are predominantly white. Six black American women are included in the exhibition, among them are Mary Heilmann, Carolee Schneemann, and Judy Chicago. The book and the exhibition are ambitious, confrontational and far-ranging in scope.

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Members of MIT Sea Grant designed an autonomous vehicle called the ‘Katrina’ boat, which can collect samples from waters that may be unsafe to drink or travel on. The boat was demonstrated on the Charles River on Monday, April 23, as part of the Cambridge Science Festival.

Two of MIT’s world music ensembles, Gamelan Galak Tikita and Rambax, will present a World Music Weekend at the Broad Institute on Saturday and Sunday, May 5 and May 6.

Gamelan Galak Tikita, MIT’s resident Balinese music ensemble of 30 musicians playing a shimmering orchestra of metallophones, gongs and drums, will perform traditional and modern music from Bali on Saturday, May 5, at 8 p.m. General admission is $12; $8 for students, senior citizens and MIT and Harvard community members; and free for MIT and Harvard students and children under the age of 12. Gamelan Galak Tikita will perform the world premiere of “Wariga,” the newest composition by Dewa Ketut Ait, one of Bali’s most innovative young composers. “Wariga,” loosely translated, means “carnal convergence,” and the piece is inspired by the auspicious and inauspicious days found in the cycles of the Balinese calendar. The ensemble, led by MIT Professor Evan Ziporyn, will also perform “Taruna Jaya,” or “Dance of the Victorious Youth,” an early 20th-century composition, featuring dancer Cynthia Lahawai, “Gringsing,” and “Pelug Sendro,” a groundbreaking composition for the group, features two gamelans playing together. For more information, see www.galaktika.org.

Rambax MIT, an ensemble dedicated to learning the art of sabar, a vibrant drum and dance tradition of the Wolof people of Senegal, West Africa, will present a free concert on Sunday, May 6, at 3 p.m. Titled “Cosaan” (“tradition” in the Wolof language), the event combines Senegalese drumming, song and dance, and also features the traditional Senegalese lion dance known as samba. Special guest artists include Senegalese master drummers and dancers Paa Seck, Moha Seck, Talla Ngom, Cheikh Ngom and Demba Sène. Co-directed by artist-in-residence Lamine Touré and Associate Professor Patricia Tang, Rambax MIT consists of MIT students and other members of the MIT community. For more information, visit web.mit.edu/rambax.

Pulse Car is a single-passenger, all-electric commuter concept vehicle powered by Professor Yet-Ming Chiang’s new generation of lithium-ion rechargeable batteries. The Pulse Car, on display at the MIT Museum, was developed by an international group of students at the 2006 MIT Vehicle Design Summit.