



Volume 53, Number 7
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FROM 'SILENCE' TO SCIENCE

MIT-rooted play to premiere next month in London

Stephanie Schorow
News Office correspondent

Was it coincidence? An era dubbed “the time of silence” — the years between 1642 and 1660 in England when Puritan rulers shuttered theaters — was also a period of intense interest in experimental science.

Three years ago, MIT students began to take an in-depth look at this period during a drama, science and performance seminar taught by professors Janet Sonenberg and Diana Henderson. Research and other material developed by students have served as the basis for an unusual play, premiering Nov. 12 in London, that examines themes of science, philosophy, creativity and family relations.

The Royal Shakespeare Company’s production of “The Tragedy of Thomas Hobbes,” written by Adriano Shaplin and directed by Elizabeth Freestone, will run through Dec. 6 at Wilton’s Music Hall in what Sonenberg characterizes as a “wild and daring enterprise” that overturns precon-

ceived notions of what a “science play” is all about.

“We’re trying to give the audience a layered story that moves them on many different levels, some of which includes a bold ride through history and through science, but more importantly, through this deep human reality that scientists are not exempt from,” said Sonenberg, the play’s dramaturg.

The play has characters representing Hobbes (1588-1679), a philosopher and scientist; Robert Hooke (1635-1703), a scientist who coined the term “cell”; Robert Boyle (1627-1691), a philosopher, chemist, physicist and inventor; political leader Oliver Cromwell (1599-1658); and King Charles II, as well other historical and fictitious figures. The plot gives a sense of the era’s political unrest and scientific excitement.

“This is a moment when the world is turned completely upside down,” said Sonenberg, professor of theater arts and

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Diversity Leadership Congress to meet next month

Greg Frost
News Office

More than 300 academic, administrative and student leaders will gather next month for the Diversity Leadership Congress, which represents an opportunity to accelerate MIT’s long-standing efforts at promoting diversity and inclusion by inspiring and supporting those most responsible for creating such a culture.



Alexis Herman

“The Diversity Leadership Congress is designed to acknowledge that progress on diversity at the Institute occurs locally,” said MIT President Susan Hockfield, who originally proposed the congress earlier this year. “We want to support these leaders and give them the tools for leading their local efforts and inspire them to do even more.”

All members of the MIT community are invited to participate in the Nov. 18 congress in a number of ways, including attending one of the remote viewing locations (the Mezzanine Lounge and West Lounge, both in the Student Center, as well as Room E25-111). Facilitators will lead group discussions at these locations, and notes from the talks will be added to the congress proceedings. Members of the community may also submit questions for the panelists in advance of the event (diversityleaders@mit.edu). Individuals and groups will be able to watch video of the Congress once it is posted online following the event at the Congress’ web site, <http://web.mit.edu/diversityleaders/>.

Participants at the congress will also be

►Please see **DIVERSITY**, **PAGE 7**

A giant leap for MIT: 4 alumni-astronauts will simultaneously be in orbit

Liv Gold
Alumni Association

In November, as more than 120,000 MIT graduates roam the earth below, four of their fellow alumni will, for the first time in history, be simultaneously traveling in space.

Michael Fincke ’89 began his ascent into space aboard the Soyuz space capsule, which launched on Oct. 12. Fincke, commander of the Expedition 18 mission to the International Space Station (ISS), will spend the next six months aboard the ISS and meet up with colleague Gregory Chamitoff PhD ’92, who has served as a flight engineer and science officer on the ISS since June.

On Nov. 14, mission specialists Heidemarie Stefanyshyn-Piper ’84 and Stephen Bowen ENG ’93 will also head to the ISS via Shuttle Mission STS-126. Piper, Bowen and the rest of the crew plan to deliver equipment that will enable larger crews to reside aboard the complex.

Two MIT astronauts have been in space at the same time on several other occasions — during six space shuttle missions and one Apollo mission — but this is the first time four have been gravity-free at once.

In fact, the alumni count could have been even higher.

Michael Massimino SM ’88, ENG ’90, ME

►Please see **SPACE**, **PAGE 3**



MIT alumnus Gregory Chamitoff PhD ’92 floats aboard the International Space Station recently.

PHOTO / NASA

PEOPLE

Picower, McGovern add on

New viral core facility for neuroscience attracts two new experts to MIT.

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RESEARCH

Methane rises

Researchers find that the levels of the greenhouse gas methane are rising after years of stability.

PAGE 4

NEWS

Patent pending

Researchers are urged to contact MIT’s Technology Licensing Office to protect their inventions.

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Events at MIT



Today

• **“Mathematics of Sea Ice to Help Predict Climate Change.”** Speaker: Professor Kenneth M. Golden, Department of Mathematics, University of Utah. 4-5 p.m. in 54-915. Part of the EAPS Department Lecture Series.

• **“Street Songs in Paris, 1749: A Cabaret-Lecture”** with Robert Darton and Helene Delaveau. Killian Hall, with a reception to follow.

• **Pumpkin Carving.** 9-10:30 p.m. W84-24th floor. Pumpkin carving is a popular event in Tang every year near Halloween. Pumpkins, carving tools, patterns, and a brief lesson are provided. Interested residents enter a final contest where a prize is awarded.

• **2008 MIT Research and Development Conference.** 8 a.m.-12:30 p.m. in W16, Kresge Auditorium.
URL: <http://ilp-www.mit.edu/events/RD2008>

• **“Innovation in Media Technology: How Big Companies Help Little Companies Grow.”** Speaker: Michael Dunn, VP of Hearst Interactive Media. Noon-1 p.m. in E51-325. Come learn about the dynamics of large and small companies in the media industry and how the relationships can work for everyone.

• **MIT FEMA Trailer Challenge Launch.** 7:30-9:30 p.m. in 10-105. The MIT FEMA Trailer Project is pleased to announce the launch of the MIT FEMA Trailer Challenge, a campus-wide competition sponsored by the MIT Visual Arts Program and the MIT Public Service Center. MIT Students: What would you do with 94,000 surplus FEMA Trailers? Join the MIT FEMA Trailer Challenge and propose alternative uses for thousands of surplus FEMA Trailers.
URL: <http://fematrailer.mit.edu/>

Thursday, Oct. 30

• **MIT Writers Series: Courtney Humphries '04.** 7-8 p.m. in 32-141. Reading from her book, “Superdove: How the Pigeon Took Manhattan ... and the World.”

• **Center for 21st Century Energy Fall 2008 Seminar Series.** Speaker: Amir Maria on “The Role of Fuel in Determining the High Load Limit of HCCI Engines.” 4-5 p.m. in 37-212.

• **CMS Colloquium:** “Tak Toyoshima: Tracking Secret Asian Man.” 5-7 p.m. in 2-105. Tak Toyoshima’s comic strip “Secret Asian Man” has brought to light the challenges of being Asian American in America.

• **“A Midsummer Night’s Dream.”** 8-10:30 p.m. in W20, Sala de Puerto Rico. Directed by Ted Eaton. Show opened Oct 23-25.
URL: <http://www.mit.edu/activities/ensemble/>

W1 renovations paused amid economic uncertainty

Administrators working with students on next steps

Greg Frost
News Office

Construction on the W1 residence hall will be paused as a precautionary measure amid general economic uncertainty.

Administrators said MIT remains committed to completing the \$90 million renovation of W1, formerly known as Ashdown House, but the current economic environment calls for thoughtful deliberation around the project’s timing. The building, which for many years served as a graduate residence hall, had been scheduled to become an undergraduate residence beginning in 2010.

To explore the best course of action, senior administrators have conducted a series of meetings with those groups and individuals most affected: the members of the Task Force for Student Engagement;

housemasters of both W1 and NW35; W1’s founding students — the Phoenix Group — who have formed a community in the new Ashdown House (NW35); and members of the Ashdown House Executive Committee.

Administrators said they had particularly benefited from the advice and counsel of students who participated in the meetings. They added that they were committed to working with students on the future evolution of the Phoenix Group, and to continuing to support and nurture a new residential community despite the delay.

“In the context of the continuing financial turmoil around the world, MIT fortunately remains in a strong position to support its teaching and research,” said Chancellor Phillip L. Clay. “Nevertheless, since the future of the economy remains unpredictable, this is a prudent moment to look for opportunities to preserve financial flexibility wherever possible.”

Vice Chancellor and Dean for Graduate Education Steve Lerman noted that W1

still promises to become an outstanding feature of undergraduate residential life at MIT. However, he noted that in the search for places to limit new commitments of capital, W1 presents an unusual opportunity because of the stage of the project: interior demolition is complete, but the Institute has not yet signed the contracts to begin full construction.

MIT has no plans to reassess the timing for campus development projects that have already advanced into the construction phase, including the Media Lab extension, the David H. Koch Institute for Integrative Cancer Research, the MIT Sloan building and garage, and the Vassar Streetscape.

Teams of students, housemasters and professionals from the offices of the Dean for Student Life and MIT Facilities have collaborated over the past year to develop plans for W1.

“We expect these productive collaboration to continue as we look forward to the future start of the work,” said Dean for Student Life Chris Colombo.

MIT Furniture Exchange holding open houses in early November

The MIT Furniture Exchange is celebrating its 50th anniversary this year, with three days of open houses on Saturday, Nov. 1 (from 10 a.m.-1 p.m.), Tuesday, Nov. 4 (from 10 a.m. to 4 p.m.) and Thursday, Nov. 6 (from 10 a.m.-4 p.m.).

The exchange is a service project of the MIT Women’s League, and supplies MIT students, faculty, staff and alumni with reasonably priced household and office furnishings, while at the same time raising funds for scholarships with every dollar of its proceeds.

Visitors should bring with them the postcard recently sent out in order to receive an additional 10 percent discount on their purchases.

Last year, the exchange contributed \$60,000 to the Women’s League Scholarship fund for undergraduate women. For more information about the event, or how to volunteer/donate, please visit web.mit.edu/womensleague/fx/ or contact Manager Judy Halloran at 617-253-4293 or fx@mit.edu.



PHOTO / DONNA COVENEY

Mirrors, sofas and chairs are just some of the items available at the Furniture Exchange for members of the MIT community.

Awards&Honors



MIT students in running for inventors’ award

One recent MIT graduate and two current MIT graduate students have been named among 12 finalists in the National Inventors Hall of Fame Foundation’s Collegiate Inventors Competition. The award focuses on students whose inventions show practical applications to meet pressing needs in our society.

The finalists from MIT are: Greg Schroll, who graduated in June with a bachelor’s in mechanical engineering, for his work on a spherical robot that uses a control moment gyroscope to store momentum for going up inclines and over obstacles;

Heejin Lee, a graduate student in the Department of Mechanical Engineering, for work on a device that can be inserted nonsurgically into the bladder via the urethra, releasing a controlled dosage of a

drug into the bladder through osmosis; Timothy Lu, a graduate student in the Harvard-MIT Division of Health Sciences and Technology, who is working on an engineered bacteriophage — a virus that infects bacteria — that works in conjunction with antibiotics, making them much more effective. Lu also won last year’s \$30,000 Lemelson-MIT Student Prize for inventiveness.

The grand prize winner, who will be named on Nov. 19, will receive \$25,000.

Saxe named Packard fellow

MIT neuroscientist Rebecca Saxe is one of 20 young scientists to be awarded a 2008 David and Lucile Packard fellowships in science and engineering.

Saxe, an assistant professor of cognitive neuroscience, will receive an \$875,000 grant over five years to study the circuits in the human brain that give rise to the high-level aspects of human thought.

Obituaries

Leona K. Loughlin, longtime Lincoln Lab employee, 83

Leona K. (Hanlon) Loughlin, who spent most of her 38 years of employment with MIT as a document librarian at Lincoln Laboratory, died on Monday, Oct. 20. She was 83.

Born in Arlington on May 10, 1925, she was raised in Lincoln, attended Lincoln public schools and graduated from Concord High School in 1943. During World War II, she worked as a secretary at Raytheon Corporation in Waltham. She worked in the library at Lincoln Lab until her retirement in 1995.

She was involved in sports and enjoyed horseback riding, baseball and hockey and played in a volleyball league for Lincoln Lab. A longtime Lincoln resident, she enjoyed gardening and loved to shop for clothes.

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Researchers, protect your inventions

MIT's Technology Licensing Office is here to help

Publishing academic papers is a top priority for MIT researchers, but they should also be aware of the need to protect their inventions with patents. That's where MIT's Technology Licensing Office can help.

The movement of knowledge and discoveries from MIT to the general public has had a major impact on economic development and job creation, both nationally and locally. Patent protection is critical to these activities.

At any given time, more than 1,000 MIT researchers — faculty, postdocs, research staff and students — are inventors on patents being filed or prosecuted through the TLO. More than half of these patents will eventually be licensed to companies for development and commercialization with the hope of impacting the "real world." The TLO grants more than 100 licenses a year, many involving a suite of patents; between 20 and 30 of these go to start-up companies.

Why patents matter

Companies' investments in "university stage" inventions are typically very risky, because neither the technical practicality nor the market potential of the technology is established. Often very substantial financial investment is needed to bring them to market — with substantial risk

that the investment will not pay off. Strong patent protection is a company's best protection from later competitors if the product is successfully brought to market.

In a global economy, worldwide patent protection is most valuable. But, except in the United States (and a few much smaller countries), any public disclosure before a priority patent is filed will bar filing for patent protection. Public disclosure can include written publications, Internet descriptions, poster sessions and even public talks.

Fortunately, only one priority patent need be filed in the United States before the public disclosure. This then preserves the possibility of later filing for international patents.

How to protect your invention

The TLO encourages researchers with a potential invention to submit a Technology Disclosure form — available for download at http://web.mit.edu/tlo/www/community/inv_disc.html — at the time a first rough draft is made of a potential publication, poster session, or planned talk to anything other than an all-MIT audience. The form will ask for the anticipated date of first public disclosure.

Upon receipt of the Technology Disclosure, the TLO will evaluate whether the invention appears to have commercial potential. If time allows prior to public disclosure, the TLO will also ask a member of the inventing team — usually

a postdoc or graduate student — to meet with the TLO's search librarian to search for "prior art" (references, including patents, that may show prior invention by others). A patent application will be filed if no damning prior art is found and if the invention is assessed as having potential commercial applicability.

"We hope to get Technology Disclosures at least a couple of months prior to the publication, but we will never ask the researchers to delay their publication; we understand the academic priorities," said TLO Director Lita Nelsen. "If necessary, we can file a 'rush' patent application — but more time allows better quality."

What to do if you have already published

All is not lost if you have published before filing a patent application. Unlike in most foreign countries, U.S. patent law allows filing within one year after publication. Clearly, it's better to have worldwide patent protection, but a U.S. patent will cover any products made in the United States, wherever sold; or imported to the United States, wherever made.

It is also possible that your publication was not "enabling" — that is, did not provide sufficient detail to enable others to replicate your invention. In this circumstance, worldwide patent protection may still be available.

For further information, see the TLO web site at web.mit.edu/tlo/www or contact the TLO at: tlo@mit.edu.

MIT neuroscience bolstered by new faculty, viral core facility

Deborah Halber

News Office correspondent

A facility exploiting viruses' ability to inject DNA precisely and efficiently into brain cells and two new experts on the molecular underpinnings of the brain's ability to change in response to experience will bolster neuroscience at MIT, home to one of the largest brain sciences research centers in the world.

With funding from an anonymous donor, the Picower Institute for Learning and Memory and the McGovern Institute for Brain Research are establishing a new core facility for viral vector research geared toward understanding the brain through genetic manipulation of the nervous system.

Viral vectors — used to deliver genes directly into cells in living animals for basic research and for human clinical applications — have become an essential tool for manipulating gene expression in the nervous system.

Viruses are masters at infiltrating their own DNA into host cells. Viral vectors exploit this ability, and are engineered to make the viral particles safe and incapable of replication. In addition to serving as a basic research tool, similar vectors are used for gene therapy and are being tested clinically for nervous system diseases including Batten disease, Alzheimer's disease and chronic pain.

"Because production of these viruses requires special expertise not often found in neuroscience labs, the new facility will be an important enabling resource for the Picower and McGovern institutes. We expect that it will support a wide range of research programs in basic and translational neuroscience," said Mark F. Bear, director of the Picower Institute and a driving force behind the facility.

The viral core facility will be directed by Rachael Neve, a former faculty member at Harvard Medical School and director of the Molecular Neurogenetics Laboratory at McLean Hospital in Belmont, Mass., and one of the world's foremost experts on gene delivery in the nervous system. The facility will begin operation later this year. Building on the strengths of the



Weifeng Xu

McGovern and Picower institutes in molecular and cellular neuroscience, two new faculty members are joining MIT later this year and in early 2009. Both will hold joint appointments as assistant professors in the Department of Brain and Cognitive Sciences.

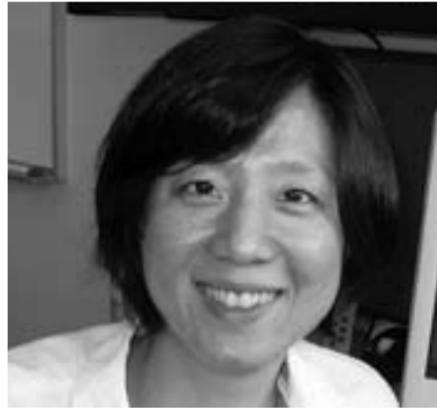
New faculty members appointed

Yingxi Lin comes to the McGovern Institute from Harvard Medical School, where she was a postdoctoral associate with Michael E. Greenberg, director of neuroscience at Children's Hospital Boston. Lin has been studying the development of inhibitory synaptic connections within the brain.

In work recently published in *Nature*, she has identified the transcription factor nPas4 as a key regulator of inhibitory synapse formation. nPas4 regulates many other genes in response to electrical activity. One of these genes has recently been identified as a possible autism risk factor.

Lin plans to continue studying these genes in her new laboratory at the McGovern Institute, using a combination of molecular genetic and electrophysiological approaches to understand how activity shapes the wiring of inhibitory brain circuits. Lin received her bachelor's degree in physics and engineering from Tsinghua University, and her PhD in biophysics from Harvard University.

Weifeng Xu comes to the Picower



Yingxi Lin

Institute after serving as a postdoctoral associate in the psychiatry and behavioral sciences laboratory of Rob Malenka at Stanford University Medical Center. Xu studies the molecular mechanisms of synaptic plasticity, the brain's ability to change in response to experience. Synaptic changes are believed to underlie many forms of learning and memory.

Using state-of-the-art techniques to knock out, over-express and replace genes, Xu manipulates synapses to see how those changes play out at the circuit level and ultimately determine how behavior is modified by experience. She is particularly interested in PSD-95, a scaffolding protein believed to be a critical player in synaptic plasticity, and its associated molecules.

Xu also looks at how mechanisms underlying electrical signaling in the brain control information processing among neurons.

"If we know under normal conditions how synapses get stronger or weaker, we can relate that to deficits that affect our cognitive abilities such as Alzheimer's disease and schizophrenia, eventually fine-tuning synapses to enhance learning or compensate for cognitive impairment," she said.

Xu, a native of northeast China near Harbin, majored in biophysics at Peking University and received a PhD in neuroscience from Brown University. She will join Picower in January 2009.

Events
at MIT



Monday, Nov. 3

- **STS Program's Fall 2008 Colloquia on "Cold War Knowledges: A New Look."** How Shall We Compare Cold War and Contemporary Military Instructional Technologies? Sharon Ghamari-Tabrizi, independent scholar, 5 p.m. in E51-095.

- **City Design and Development Forum: Landscape + Urbanism.** Speaker: Alan Berger, associate professor Urban Design and Landscape Architecture, P-Rex. 5-6:30 p.m.

- **Communicating Across Cultures.** Speaker: Lori Breslow, director of MIT Teaching and Learning Laboratory and Senior Lecturer of Sloan School of Management. 12:15-2 p.m. in 7-338.

Tuesday, Nov. 4

- **Has The Sun Finally Risen on Photovoltaics?** Speaker: Dr. Mark R. Pinto. 4-5 p.m. in 34-101. MTL Seminar Series. The idea of solar generated electricity dates to discovery of the photovoltaic (PV) effect in 1839 through to the first silicon solar cell in 1954. But even with concerns about oil and the environment, PV currently generates less than 0.1 percent of the world's electricity.

- **Emile Bustani Middle East Seminar: Who Speaks for Islam?** Speaker: Dalia Mogahed, executive director of Gallup Center for Muslim Studies. 4:30-6:30 p.m. in E51-095.

Submit your events!

Log on to events.mit.edu to add your events to MIT's online calendar. Select events will be selected from the online calendar to be published in Tech Talk each Wednesday.

SPACE: 4 alumni-astronauts in orbit at the same time

Continued from Page 1

'90, PhD '92, and John Grunsfeld '80 were scheduled to commence an 11-day Hubble servicing mission on the same day as the STS-126 launch. However, a control system failure in the Hubble telescope has delayed the mission's launch to as late as February 2009.

And, as though four alums in space weren't coincidence enough, the MIT Alumni Travel Program trip, "Inside the Russian Space Program," put even more alumni on the scene on Oct. 12. The travelers, who hail from MIT as well as Princeton University, were on hand in Kazakhstan to watch the launch of the Soyuz space capsule transporting fellow alums to the ISS.

Awards
& Honors



EECS associate professor wins early career award

Electrical Engineering and Computer Science Associate Professor Joel Voldman was presented the Young Innovator's Award — for exceptional technical advancement and innovation in his or her early career — at the 12th International Conference on Miniaturized Systems for Chemistry and Life Sciences.

Levels of the greenhouse gas methane begin to increase again

New surge ends a decade of stability; cause still unknown

David Chandler
News Office

The amount of methane in Earth's atmosphere shot up in 2007, bringing to an end a period of about a decade in which atmospheric levels of the potent greenhouse gas were essentially stable, according to a team led by MIT researchers.

Methane levels in the atmosphere have more than tripled since pre-industrial times, accounting for around one-fifth of the human contribution to greenhouse gas-driven global warming. Until recently, the leveling off of methane levels had suggested that the rate of its emission from the Earth's surface was approximately balanced by the rate of its destruction in the atmosphere.

However, since early 2007 the balance has been upset, according to a paper on the new findings being published this week in *Geophysical Review Letters*. The paper's lead authors, postdoctoral researcher Matthew Rigby and Ronald Prinn, the TEPCO Professor of Atmospheric Chemistry in MIT's Department of Earth, Atmospheric and Planetary Science, say this imbalance has resulted in several million metric tons of additional methane in the atmosphere. Methane is produced by wetlands, rice paddies, cattle, and the gas and coal industries, and is destroyed by reaction with the hydroxyl free radical (OH), often referred to as the atmosphere's "cleanser."

One surprising feature of this recent growth is that it occurred almost simultaneously at all measurement locations across the globe. However, the majority of methane emissions are in the Northern Hemisphere, and it takes more than one year for gases to be mixed from the Northern Hemisphere to the Southern Hemisphere. Hence, theoretical analysis of the measurements shows that if an increase in emissions is solely responsible, these emissions must have risen by a similar amount in both hemispheres at the same time.

A rise in Northern Hemispheric emissions may be due to the very warm conditions that were observed over Siberia throughout 2007, potentially leading to increased bacterial emissions from wetland areas. However, a potential cause for an increase in Southern Hemispheric emissions is less clear.

An alternative explanation for the rise may lie, at least in part, with a drop in the concentrations of the methane-destroying OH. Theoretical studies show that if this has happened, the required global methane emissions rise would have been smaller, and more strongly biased

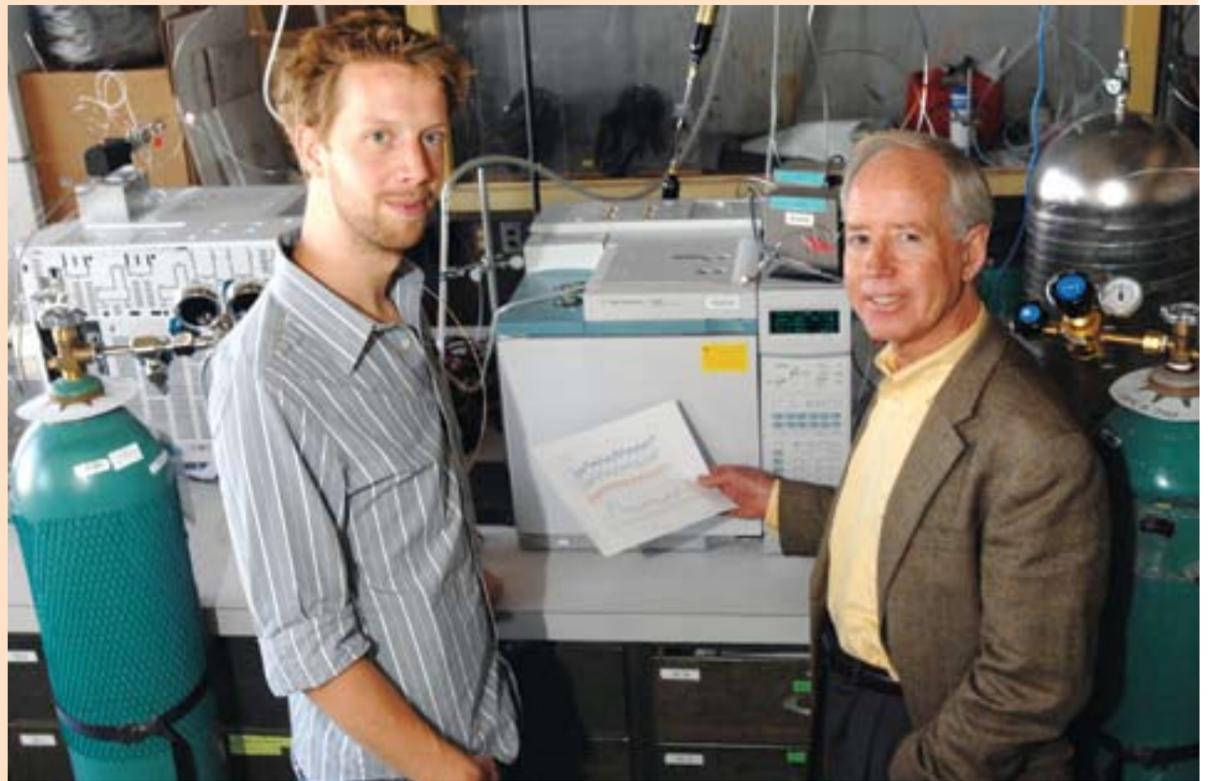


PHOTO / DONNA COVENEY

Postdoctoral researcher Matthew Rigby and Ronald Prinn, the TEPCO Professor of Atmospheric Chemistry in MIT's Department of Earth, Atmospheric and Planetary Science, stand in front of a gas chromatograph, a key component of the trace gas measurement system used in the Advanced Global Atmospheric Gases Experiment (AGAGE).

to the Northern Hemisphere. At present, however, it is uncertain whether such a drop in hydroxyl free radical concentrations did occur because of the inherent uncertainty in the current method for estimating global OH levels.

To help pin down the cause of the methane increase, Prinn said, "the next step will be to study this using a very high-resolution atmospheric circulation model and additional measurements from other networks." But doing that could take another year, he said, and because the detection of increased methane has important consequences for global warming the team wanted to get these initial results out as quickly as possible.

"The key thing is to better determine the relative roles of increased methane emission versus an increase in the rate of removal," Prinn said. "Apparently we have a mix of the two, but we want to know how much of

each" is responsible for the overall increase.

It is too early to tell whether this increase represents a return to sustained methane growth, or the beginning of a relatively short-lived anomaly, according to Rigby and Prinn. Given that, pound for pound, methane is 25 times more powerful as a greenhouse gas than carbon dioxide, the situation will require careful monitoring in the near future.

In addition to Rigby and Prinn, the study was carried out by researchers at Commonwealth Scientific and Industrial Research Organization (CSIRO), Georgia Institute of Technology, University of Bristol and Scripps Institution of Oceanography. These methane measurements come from the Advanced Global Atmospheric Gases Experiment (AGAGE) that is supported by the National Aeronautics and Space Administration (NASA), and the Australian CSIRO network.

Tuning in to unconscious communication, MIT researchers discover revealing clues in conversations

David Chandler
News Office

What you say in a conversation — whether it's on a first date, a job interview or pitching an idea — may be less important than how you say it. But the cues that may decide the outcome can be so subtle that neither person in the conversation is consciously aware of them.

Whether or not you get the job, or the other person's phone number, is very strongly influenced by unconscious factors such as the way one person's speech patterns match the other's, the level of physical activity as people talk, and the degree to which one person sets the tone — literally — of the conversation. These subtle cues provide "honest signals" about what's really going on and strongly predict the outcome, according to research by the MIT Media Lab's Alex "Sandy" Pentland and his colleagues.

"Honest Signals" is also the title of Pentland's new book about the research, being published this month by MIT Press. The research was based on tens of thousands of hours of data from devices about the size of a credit card that record movements and voices, which Pentland has dubbed "sociometers." Using just this data, with no knowledge of what was said, Pentland could predict the outcome — whether a job offer, a second date, or investment in a business plan — more accurately than by using any other single factor.

Pentland says that this technology is recording and quantifying something that most people already under-

stand intuitively. "All of this is sort of folk knowledge," he said. "We all know it's there, but we all ignore it."

Pentland, who has a degree in psychology and experience in signal processing, zeroed in on "a few things that seem to come up again and again" in deciding what aspects of human communication to monitor with the new devices.

The features he found that are highly predictive of outcomes, he says, "match the literature in biology about signaling in animals." In fact, Pentland suggests, the nonlinguistic channels of communication that are measured by the sociometers may have started among our ancestors long before the evolution of language itself, forming a deeper, more primal way of understanding intentions, coordinating activities and establishing power relationships within the group.

"Half of our decision-making seems to be predicted by this unconscious channel," says Pentland, the Toshiba Professor of Media Arts and Sciences. "That's exactly the channel that you see in apes" as they coordinate their activities without the use of language.

Pentland's research on these nonlinguistic signaling channels has been based on getting groups of people, such as attendees at a conference or employees of a company, to wear the sociometers over periods ranging from a day to a month or more. The devices, which include a microphone for recording voices and accelerometers to measure

a person's movements, are a bit smaller than the name badges typically worn at conferences. In future research, he says, the same functions could be monitored using specially programmed cellphones.

The data gathered from the devices can be used not only to predict the outcomes of specific interactions between people, but even the relative productivity of different teams within a company. "This information is not in the organizational charts," Pentland says. "This human side is missing from all traditional measures" of how groups of people work together.

The strong correlations between unconscious forms of communication and the decisions that result strongly undermine people's perception that they are making choices based on rational, conscious factors, Pentland says. "My data shows that's simply not true." By understanding and measuring factors that people are usually unaware of, he believes he is, "putting human nature back into our social fabric."

It may even help to predict the outcome of elections, he says. For example, by watching for the movements that signal the factor Pentland calls "influence" — the setting by one person of the tone and pace of a conversation — in a presidential debate, it is possible to see which person is dominant, regardless of what is being said. "The person who sets the tone," he says, "is the one who wins, in every election since 1960."



Sandy Pentland

McGovern Institute funds collaborative neurotechnology projects

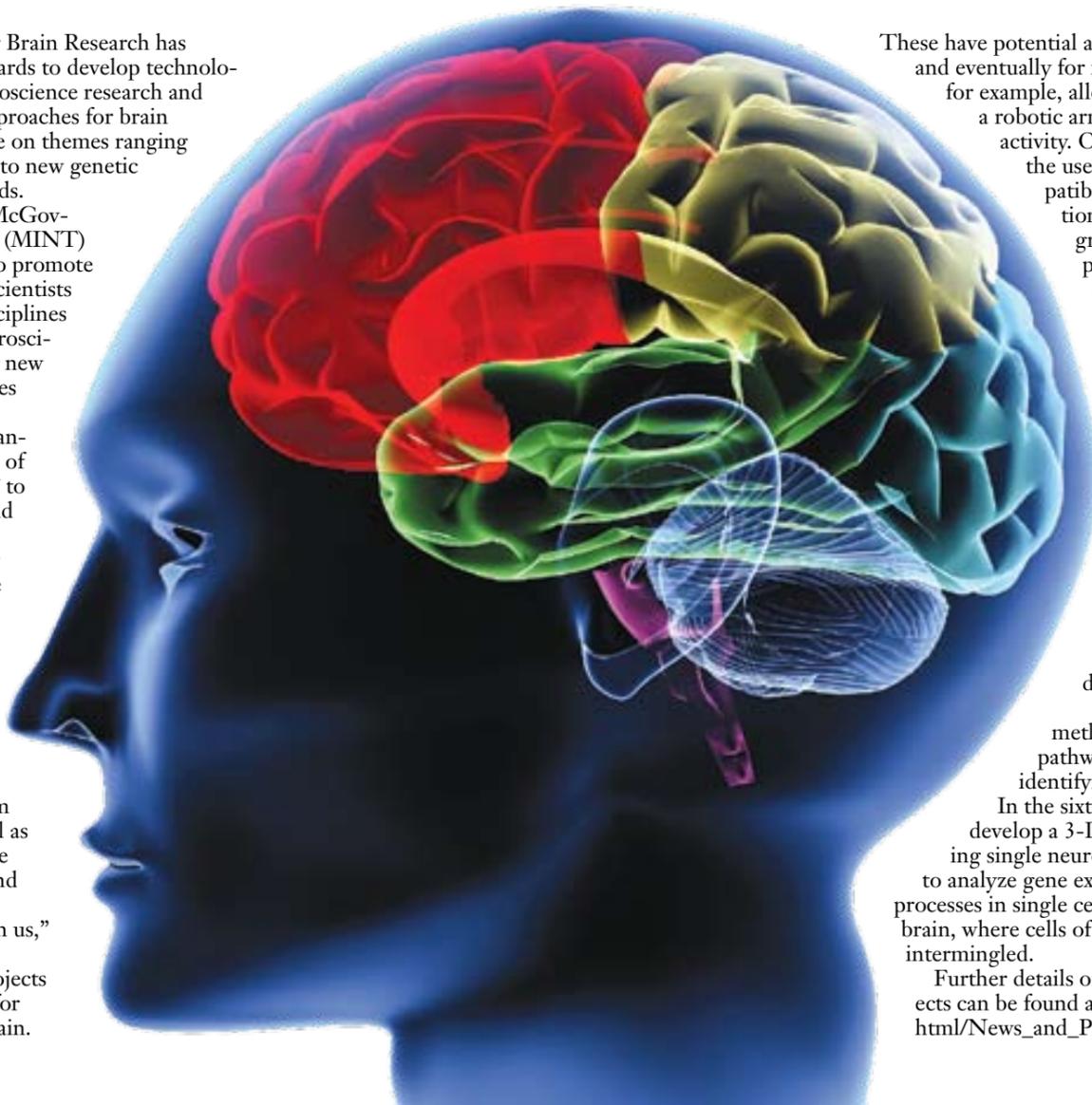
The McGovern Institute for Brain Research has announced six new funding awards to develop technologies aimed at accelerating neuroscience research and developing new therapeutic approaches for brain disorders. The new projects are on themes ranging from brain-machine interfaces to new genetic tools and brain imaging methods.

The awards are part of the McGovern Institute Neurotechnology (MINT) program, established in 2006 to promote collaborations between neuroscientists and researchers from other disciplines within and beyond MIT. "Neuroscience has always been driven by new technologies," explained Charles Jennings, the MINT program director. "We want to take advantage of the extraordinary range of technological expertise at MIT to develop new methods that could transform the field."

The MINT awards typically provide up to \$100,000 for one year of seed funding to test innovative ideas that traditional funding sources rarely support, and to determine if they are worth pursuing further.

To date, MINT has supported 11 projects, involving faculty members from seven MIT departments as well as a local startup company. "We're on the lookout for new ideas and we'd be delighted to hear from anyone who wants to work with us," Jennings said.

Two of the newly funded projects involve developing electrodes for long-term recordings in the brain.



These have potential applications for studies of learning, and eventually for neuroprosthetic devices that could, for example, allow a paralyzed patient to control a robotic arm or a computer through mental activity. One of the new projects will explore the use of carbon nanotubes as a biocompatible material for electrode fabrication. Another will develop biodegradable coatings for thin flexible polymer electrodes to make them easier to insert into the brain.

Neuroscientists often face a challenge in analyzing the large datasets produced by human brain imaging studies. Two MINT projects will apply new computational approaches to fMRI data from visual recognition studies. If successful, these methods could reveal new insights into the brain's functional organization. They could also advance the study of brain disorders, for example by identifying relationships among brain activity, genetics and clinical diagnostic categories.

A fifth project will use optical methods to manipulate cell signaling pathways in vivo, with potential use in identifying targets for drug development.

In the sixth project, the collaborators will develop a 3-D laser-based method for dissecting single neurons from brain tissue. The ability to analyze gene expression and other biochemical processes in single cells is especially important in the brain, where cells of many different types are closely intermingled.

Further details of these and previous MINT projects can be found at http://web.mit.edu/mcgovern/html/News_and_Publications/2008_seed.shtml.

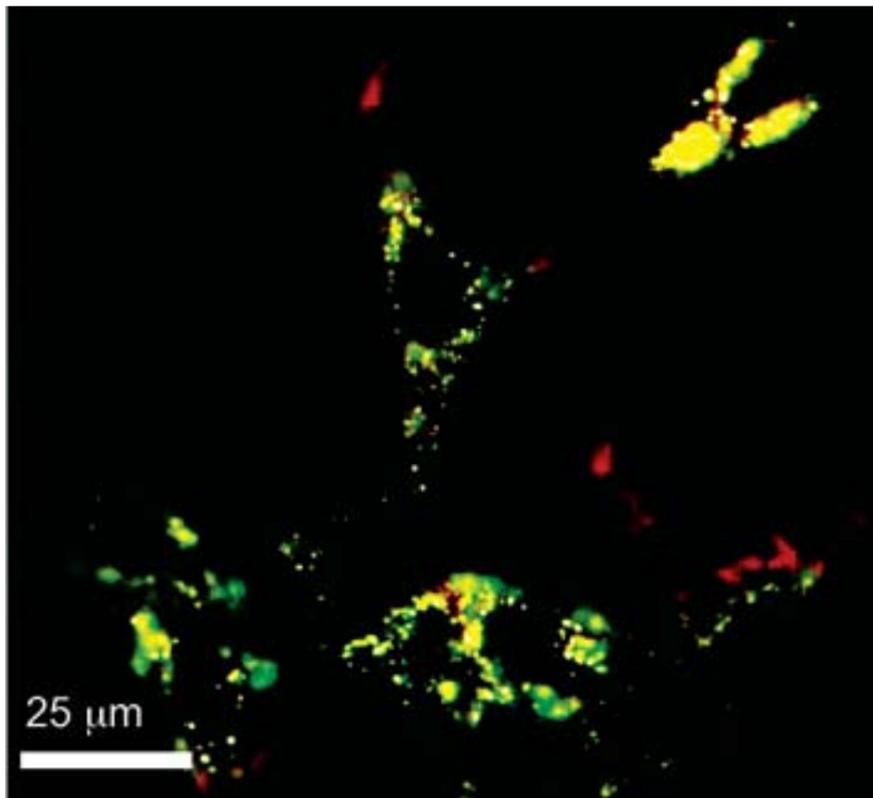


PHOTO / SHANTA DAR

Direct delivery

MIT researchers have custom-designed nanoparticles that can deliver the cancer drug cisplatin specifically to prostate cancer cells. In this image, the yellow areas indicate prostate cancer cells that have taken up nanoparticles encapsulated with a platinum(IV) prodrug, which delivers a lethal dose of cisplatin — a drug commonly used to treat several types of cancer.

The new research was published online last week in the Proceedings of the National Academy of Sciences. Authors of the paper are Shanta Dhar, postdoctoral fellow in chemistry; MIT affiliate Frank X. Gu; Institute Professor Robert Langer; Omid Farokhzad, assistant professor at Harvard Medical School; and Stephen Lippard, the Arthur Amos Noyes Professor of Chemistry.

Awards&Honors



PhD candidate wins R.V. Jones Memorial Scholarship

Vijay Shilpiekandula, a PhD candidate in the Department of Mechanical Engineering, was awarded the 2008 R.V. Jones Memorial Scholarship by the American Society for Precision Engineering (ASPE) for his paper titled, "A Flexure-based Mechanism for Precision Angular Alignment at Large Loads," co-authored with his academic advisor Professor Kamal Youcef-Toumi. The award, which includes a \$1,000 honorarium, was presented at the Annual Meeting of ASPE and the 12th ICPE at Portland, Ore., in October.

The paper, selected by the ASPE Educational Scholarship Committee from a pool of student applications, stems from Shilpiekandula's doctoral thesis research on the design and control of flexure-based nanopositioning systems. The research was conducted at the MIT Mechatronics Research Laboratory and was supported by the Singapore-MIT Alliance and a research grant from Haythornthwaite Foundation, American Academy of Mechanics.

Finkelstein wins prestigious women in economics awards

The Elaine Bennett Prize, an award presented every other year by the Committee on the Status of Women in the Economic Profession to "recognize, support and encourage outstanding contributions by young women in the economics profession," was recently awarded to Amy Finkelstein, a professor in the Department of Economics.

Haldeman novel rights acquired by director Ridley Scott

Ridley Scott, director of films including "Blade Runner" and "Alien," has acquired the rights to Joe Haldeman's science fiction novel, "The Forever War." The book by Haldeman, an adjunct professor in the Program in Writing and Humanistic Studies, focuses on a soldier who spends a few months battling in space, only to come home 20 years later to find a changed planet.

VP Grochow named ACM Distinguished Engineer

Vice President for Information Services & Technology Jerrold Grochow has been selected as an Association for Computing Machinery (ACM) Distinguished Engineer. The honor is given to those who "have achieved a significant accomplishment in, or made significant impact on, the computing field."

Conference weighs Electoral College pros and cons

Stephanie Schorow
News Office correspondent

In a lively, sometimes contentious, conference at MIT on the problems and merits of the Electoral College, a group of scholars looked into what one called the “fun-house mirror of electoral politics” and debated its reflections of federalism, states’ rights and equality.

Some participants in the Oct. 17 event, “To Keep or Not to Keep the Electoral College,” which was co-sponsored by the Carnegie Corporation and the MIT Sloan School of Management, argued passionately that choosing a president by popular vote — rather than the current state-by-state, winner-take-all contests — would upset the balance of powers among the branches of government, encourage disruptive third parties and decrease the power of ethnic minorities.

The greatest fear of the Founding Fathers was majority tyranny,” said Judith Best, SUNY Cortland political science professor. “Our goal is not just majority rule, but majority rule with minority consent.”

Others argued choosing a president by popular vote is fairer and would lead to greater voter participation. Currently, “There is an incentive to campaign hard in swing states and ignore the others,” said Northwestern Law Professor Robert W. Bennett.



Akhil Reed Amar, Yale law professor, said the one-person, one-vote rule is the very foundation of democracy; all 50 states elect officials by simple majorities and “it works just fine.” Vikram Amar, UC Davis associate dean for academic affairs, argued that the current push for a popular vote — the National Popular Vote Interstate Compact, joined by Hawaii, Illinois, Maryland and New Jersey — did not require a Constitutional amendment to enact.

Several MIT professors discussed ways of combining features of both a popular vote and the Electoral College. Arnold I. Barnett, the George Eastman Professor of Management Science and one of the conference organizers, proposed a “weighted vote” system, which allows smaller states to retain their electoral clout. The chair of the conference’s steering committee, Alexander S. Belenky, visiting scholar in the Center for Engineer-

ing Systems Fundamentals, proposed that the president should be chosen by a majority of the nationwide popular vote and popular vote majorities in at least 26 states, even if his/her opponent wins the Electoral College.

Alan Natapoff, research scientist in the Department of Aeronautics and Astronautics, argued the advantages of a system that would use actual turnout instead of population as the basis for calculating a state’s electoral votes, but would maintain the other main features — winner-take-all states and senatorial electoral votes — of the Electoral College. This would, he said, increase an individual’s voting power in poorly contested states like Massachusetts.

A chief discussion point was whether eliminating the Electoral College would create disruptions in close elections, or as Best put it, “50 Floridas,” a reference to that state’s recounts in the 2000 election. The presidency, she argued, is too important a position to be in doubt. “A swift, sure decision is more important than a decision that is 100 percent accurate, down to the last vote,” she said.

Akhil Amar, however, noted that huge states, with widely divergent populations and geography such as California, pick governors by popular vote without recount fiascos. As for the problems of carefully counting to the last vote, “It’s called democracy,” he asserted.

PLAY: MIT rooted play premiering next month in London

Continued from Page 1

section head of music and theater arts.

The collaboration between MIT and the RSC began several years ago when MIT Corporation Chairman Dana Mead introduced the two organizations with an eye toward forging connections between them. Sonenberg began conducting her imagination technique with the actors, directors and designers of the RSC, and during one of those productions she posed the idea for the play to Michael Boyd, the RSC’s artistic director.

Sonenberg, who has developed new acting techniques and is the author of “The Actor Speaks” and “Dreamwork for Actors,” became intrigued with the idea of creating a play set during the Puritan Revolution, appreciating the irony of a theater piece about a time when public theater was halted. After the project received a grant from the Ensemble Studio Theater and the Sloan Foundation, she and Henderson, an expert on Shakespeare, drama and gender studies, developed a seminar in which students delved into 17th-century history, dug out original materials, and created dramatic scenes. “We wanted them to see the two-way street between the past and the present,” Henderson said.

Henderson and Sonenberg brought in Shaplin, a New York-based contemporary playwright



PHOTOS / DONNA COVENEY

ABOVE: Janet Sonenberg
BELOW: Diana Henderson



and founder of the Riot Group, to help students hone their dramatic skills. Soon students were writing scenes that imagined what it was like to be a 17th-century actor or scientist. They recreated some of the era’s experiments, as well as some of the debates between Hobbes and Boyle. They imagined two out-of-work actors, whom Shaplin turned into the characters Rotten and Black. “They really got to see how a play gets made,” said Henderson, professor of literature and dean for curricula and faculty support.

Then Shaplin took the material and began working on a contemporary theater piece for the RSC; it opens in London in 1558 and its characters interact as if they were part of a large dysfunctional family.

“Whose version of the truth is right? Whose version of science is right? And who gets to author it?” These, Sonenberg said, are some of the questions raised by Shaplin’s drama. The work draws a “connection between the closing of the theater and the rise of experimental science, which is where science was being performed for a group of likeminded gentlemen,” Sonenberg said.

Sonenberg and Henderson, who continue to teach “Learning from the Past: Drama, Science, Performance,” hope to see a version of “The Tragedy of Thomas Hobbes” brought to MIT after its London run.

MIT Sloan to partner with world’s top business schools in new degree program

Joint global initiative creates master of science in management studies degree

With the current economic upheaval making even clearer the links between global and national economies, the MIT Sloan School of Management is launching a collaboration with a select set of the world’s top business schools to offer highly talented management students a chance to supplement their learning — and to earn a degree at MIT.

“The world needs more, not fewer, smart people who are trained to be leaders in management, especially now,” said David Schmittlein, the John C. Head III Dean of MIT Sloan. The new program, which creates a master of science in management studies at MIT, “will enable students to supplement the broad-based management education they receive in the outstanding MBA programs at the schools they already attend with the additional knowledge and management tools they can acquire at MIT.” The degree program, Schmittlein added, is an important component of MIT Sloan’s ongoing efforts to build broad-based relationships with leading management schools, including the four participating in the program.

The new MIT degree designation will begin in the 2009-2010 academic year, with approximately 15 international students and an eventual enrollment of 50.

MIT already offers several master of science specifications. The new addition builds upon MIT Sloan’s deep and varied ties to leading educational institutions around the world. “We are pleased to partner with MIT Sloan in this new double-degree program, which will enhance the capacity of our institutions to be the leading international players in educating truly global business leaders,” said Bernard Ramanantsoa, dean of HEC Paris, a leading European business school.

The new degree program, said MIT Sloan Senior Associate Dean Alan White, “supports our global collaborations, which are all about insuring our continued presence as a global university.”

Robert C. Klemkosky, dean of the SKK Graduate School of Business at Korea’s Sungkyunkwan University, termed the new program “one of the most significant events in the development of management education, not only at SKK GSB, but in Korea. It further strengthens the five-year collaboration between MIT Sloan and SKK GSB.”

MIT Sloan Deputy Dean Steven D. Eppinger said MIT Sloan faculty and students will benefit as well. “With business more global than ever, we need to do all we can to encourage connections between our faculty and students and those of some of the best management schools in the world,” he said. “This initiative will offer our partner schools the opportunity to provide their students, who have received their MBA education in one region of the world, with additional specialization in business education at MIT Sloan.”

Participating institutions in the new degree program also include Tsinghua University in Beijing and Fudan University in Shanghai. Schmittlein noted an additional benefit for both Sloan and its academic partners. “This new degree program further strengthens our relationships with four of the most distinguished educational institutions in the world,” he said. “It is a win-win for the partner schools, for MIT Sloan, and for all of our students and faculty.”

CLASSIFIED ADS

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WANTED

Left and Right hinges for Sony VAIO A Series laptop VGN-A190; Model: PCG-8Q5L Call Mary Anne, Ext. 33293 or 508-653-7123. magowen@mit.edu

PICK YOUR PRESIDENT

MIT experts hit on the Internet and voting technologies as the Nov. 4 election nears. Interviews by Stephanie Schorow

Both sides of the Net

Hal Abelson, the Class of 1922 Professor of Computer Science and Engineering at MIT, and Harry R. Lewis, the Gordon McKay Professor of Computer Science at Harvard — co-authors of “Blown to Bits: Your Life, Liberty, and Happiness After the Digital Explosion” — collaborated on answers to a series of questions about Internet policy and technology prior to the Nov. 4 election.

Question: Having examined the candidates’ platforms as posted on their respective web sites, can you assess whether McCain and Obama differ substantially on the issue of Net neutrality (the idea that delivery of content should be treated equally regardless of source)?

Abelson/Lewis: Yes. McCain explicitly rejects Net neutrality as a “prescriptive” measure; Obama explicitly supports it. Obama speaks directly to the need for competition in Internet services, an important plank missing from McCain’s technology picture. McCain would regulate Internet Service Providers (ISPs) only to ensure consumer protection and child safety. He also offers that government may have a role as a service provider of last resort, if incentives to private industry fail to achieve universal connectivity.

Q: Obama’s online platform says he will appoint the nation’s first chief technology officer. What do you think of this plan?

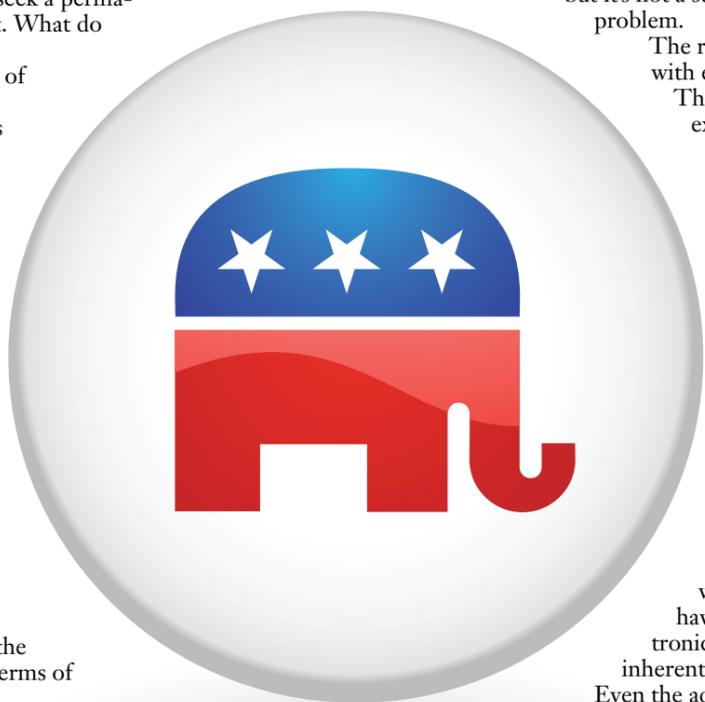
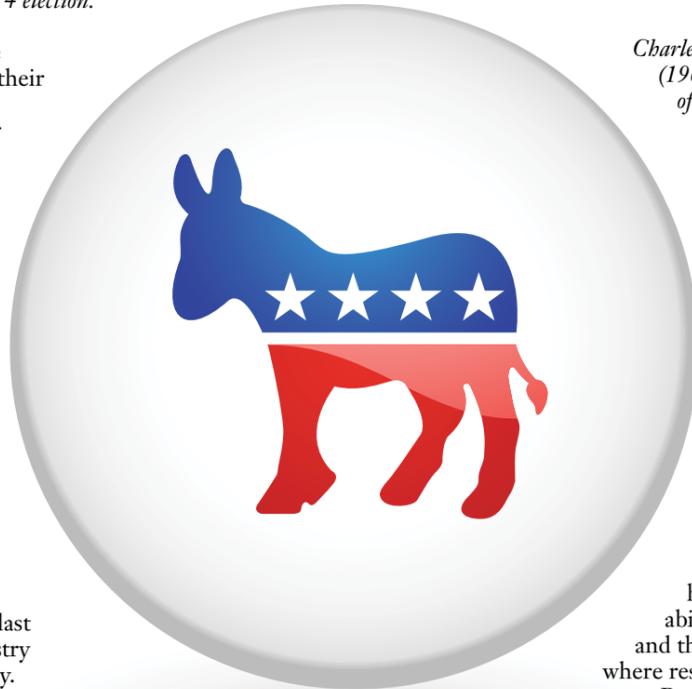
Abelson/Lewis: Most federal agencies already have CTOs. While simply creating titles never solves problems, large organizations often suffer from inefficiencies that result from inconsistent technology solutions to related problems. For the U.S. government, there is a large opportunity to harmonize policies and practices in different agencies about such crosscutting issues as information privacy, transparent government operations, and modalities for citizen input.

Q: McCain has said he would seek a permanent ban on taxes on the Internet. What do you think of this pledge?

Abelson/Lewis: The freedom of the Internet from taxation (while allowing the states to collect sales taxes on Internet commerce) has stimulated the growth of the network to the great benefit of the American economy. We do not favor taxing the Internet immediately, but one should never use the word “never” in a technology policy. The world simply moves too quickly. Visible on the horizon are problems such as the development of Internet services toward regional monopolies. It is unwise to peremptorily declare a “correct” economic model for such unknown future business realities.

Q: What other issues should the two candidates be addressing in terms of Internet access and innovation?

Abelson/Lewis: Over the past decade, executive decisions have challenged the limits of First and Fourth Amendment protections. Measures to protect children on the Internet must be justified by data about the prevalence of actual harm to children, and balanced against the government’s obligation not to limit the free flow of ideas and words among adults and children. Similarly, the effectiveness of data mining and dragnet surveillance techniques exploited in the war on terror must be assessed and balanced against the right of Americans not to have their communications and stored data searched without probable cause. Those issues will require extensive collaboration with Congress. In contrast, something the new administration can do largely on its own is to use the Internet to make government more transparent and accountable, by providing more open and consistent access to government data and creating more responsive mechanisms for citizen input.



Far from perfect: Stewart charts progress of U.S. voting security

Charles Stewart III, the Kenan Sabin (1963) Distinguished Professor of Political Science and head of MIT’s Department of Political Science, examines issues of voting security.

Question: In light of concerns over voting in 2000 and 2004, how secure are voting systems for 2008?

Stewart: The more experience we have with voting systems, the more we realize there’s a real distinction between security and reliability. There have been some well-publicized cases where teams of experts have exposed security vulnerabilities with electronic systems, and there have been other cases where researchers have “hacked” into systems. But there still isn’t any hard evidence of major security problems emerging in actual elections. However, there continue to be an unnerving number of cases where systems are shown to be unreliable. For instance, Premier Election Solutions (formerly Diebold) recently reported that a bug in the software that accepts and counts election results from individual voting machines has a flaw that can result in some ballots being dropped from the system before they are counted. It’s a stretch to call this a security problem, but it’s not a stretch to call it a reliability problem.

The reliability problems aren’t just with electronic voting machines.

The Premier Election Solutions example applies to optically scanned ballots as well as to electronic machines.

I still am confident that votes are counted better now than they were in 2000, but we still have a long way to go before anything close to perfection is achieved.

Q: Have any significant gains been made in terms of security of voting machine or paper ballots?

Stewart: I think that most computer scientists would say that no real gains have been made with the electronic systems because they are inherently insecure and unreliable. Even the addition of “paper backups” to electronic machines hasn’t been a panacea. (Again, the Premier example I mentioned before is a good example — it is possible to compare the paper reports generated by the voting machines with the electronic versions that remain after the download. However, almost no one has been doing this comparison — and these are the professional election administrators.)

The physical security of paper ballots (and of electronic machines) is probably better because states are now more aware of the need to establish a “chain of custody” of voting machines and ballots. For instance, in a lot of states, officials used to allow poll workers to take the machines home the night before the election. These so-called

“sleepovers” for the voting machines made it easier for the poll workers to get the precincts opened for voting on Election Day, but raised questions about opportunities for tampering. Sleepovers are going the way of the dodo.

So, again, I think things are better now than in 2000. However, we are much more aware of how informally elections are run in the United States, which continues to provide Election Day horror stories.

Q: What innovations do you see coming in terms of voting systems?

Stewart: I continue to be amazed that the major voting machine companies don’t adopt an open-source model of voting machine software. Computer experts will tell you that open-source election software won’t guarantee security, either, but it would allay fears of the public and probably allow the most egregious software errors to be caught. One of the barriers to the development of a robust electronic voting machine market is the lingering distrust that many elements of the public have in the quality of the software.

Q: Should the nation adopt a system of voting identification cards to protect the election process?

Stewart: It’s pretty clear that voting identification has become highly politicized, with Republicans believing that more stringent voting identification will end high levels of fraudulent voting, and Democrats believing that these ID laws will intimidate minority voters and disenfranchise the elderly. Republicans love these laws and Democrats hate them. It’s pretty clear that both sides have engaged in a great deal of hyperbole in making their cases. Accusations of large-scale fraudulent voting almost always dissolve. And, while it is certainly true that certain types of people have a harder time getting ID cards (such as the poor and the elderly), I have a strong suspicion that the lack of identification is nowhere close to the main reasons these folks don’t vote.

That said, I’ve always believed that there is a compromise that would achieve what both the left and the right want achieved. Have every state automatically register every 18 year-old to vote and send them a vote ID card. The left would get universal, automatic registration; the right would get a voter ID card. But, that’s my own personal pipe dream.

Q: If you suspect a problem while voting, what should you do?

Stewart: It depends on what the problem is, but in general, you should talk to the poll worker who is in charge of the voting precinct right away. Don’t wait until you’ve checked out, because there’s no way to undo a vote once you’ve checked out of the precinct. If there are registration issues, voters may also insist that they be given a provisional ballot, allowing them to resolve the registration problem the next day at the local election department (or town clerk) office. I, myself, have observed one precinct in Cambridge where people were just turned away from voting when there was a minor registration question, rather than even being told they could cast a provisional ballot (to be clear: these were people who were registered, or thought they should be on the registration list, but there was some question about the registration). When poll workers say there is no way to clear up registration problems on Election Day, they aren’t following the rules.