

Experts on humanoid robots discuss their creations' future

■ By Elizabeth A. Thomson
News Office

Several robots, their creators, the author of the just-published book, *Robo Sapiens*, and editors from Wired Magazine kicked off the first international conference on humanoid robots at MIT last week.

"The robots are coming, they're getting into our homes, and they'll change the world in many ways," said Professor Rodney Brooks, director of the Artificial Intelligence Lab. He was speaking at the opening reception for the conference, which was so tightly packed with humans (and one robot) that the lights went on and off as people brushed against wall switches.

Posters of the September cover of Wired greeted attendees as they stepped out of elevators at the AI Lab. The cover featured MIT Mechanical Engineering Graduate Student Dan Paluska and M2, the two-legged humanoid robot he's developing.

Professor Brooks' talk focused on robots in the home and how they'll affect our lives. He was preceded by a slide show featuring the subjects of *Robo Sapiens*, a book about humanoid robots by Peter Menzel and Faith D'Alusio (MIT Press, September 2000).

Robots are currently analogous to the computers of the late 1970s, Professor Brooks said. "There were big computers around then, but real people couldn't touch them." And
(continued on page 5)

Brown, Clay, Hopkins will head new Council on Faculty Diversity

■ By Kenneth D. Campbell
News Office

Provost Robert A. Brown has announced the appointment of a 12-member Council on Faculty Diversity to aggressively promote the racial and

gender diversity of the faculty.

The council will be co-chaired by Professor Brown, Associate Provost Philip Clay of urban planning and Biology Professor Nancy Hopkins, who is joining the Academic Council and the Dean's Committee in this role. Pro-

fessors Brown and Clay also are on the Academic Council.

President Charles Vest commented, "The formation of this Council, and the appointment of Professor Hopkins to the Academic Council, will bring renewed energy and innovation to our

long-standing commitment to build a faculty that is both world-class and diverse. We must make academic careers in general, and at MIT in particular, compelling and rewarding to the best and brightest women and minority students."

In his charge to the council, Provost Brown said, "To ensure MIT's continued pre-eminence in research, and to continue to offer the best possible education to our exceptional and diverse
(continued on page 8)



Hopkins

MIT has first experiment aboard space station

■ By Elizabeth A. Thomson
News Office
and John Tylko (SB 1979)
Special to MIT Tech Talk

The first hands-on experiment to fly aboard the International Space Station (ISS) could lead to better telescopes, robotic arms and other devices affected by vibrations in space.

The experiment, which was launched Friday aboard the space shuttle Atlantis, was developed by MIT engineers and colleagues in collaboration with the Air Force Research Laboratory (AFRL). It is expected to become operational aboard the space station in early November with the arrival of the first crew of astronauts.

(continued on page 8)

A lass aloft



Sophomore Will Fournier displays his knowledge of aeronautics to nine-year-old Michelle Theveninas by swinging her like an airplane. MIT students volunteered at this Cambridge community center, in homeless shelters and at other non-profit agencies in Cambridge and Boston as part of CityDays, an annual city-wide community service event.
Photo by Donna Coveney



Rodney A. Brooks, director of the Artificial Intelligence Lab (AI Lab), gave the opening talk at the Humanoids 2000 Conference. On the screen is Cog, a humanoid robot developed at the AI Lab. See page 4 for related story.
Photo by Donna Coveney

20-year-old Li, former student, dies of leukemia

■ By Robert J. Sales
News Office

It won't be hard to spot the friends of David Li on campus today.

They'll be wearing light blue t-shirts with the logo *Marrow Drive '99* and Mr. Li's name on the back. They are the ones who organized and sponsored two bone marrow drives last year in an unsuccessful attempt to find a match for Mr. Li, Class of 2002, who suffered from acute lymphoblastic leukemia. The 20-year-old Mr. Li died on August 7.

Mr. Li was diagnosed with leukemia as a sophomore at Peter Stuyvesant High School in New York. He continued to attend classes

while undergoing two years of chemotherapy, and graduated on time. The disease was in remission when he entered MIT in September 1998, but he had to withdraw after a semester when the leukemia returned.

Knowing a bone marrow transplant was his only hope, friends at MIT organized two searches for a match, in November and February, mindful that the chances of success were miniscule. The odds of finding a match range from 20,000-to-1 to 1,000,000-to-1. Aware of this, Mr. Li told his friends: "Don't do this for me, because chances are very slim that you'll be a match for me. Do this for your sense of charity and humanity."

(continued on page 2)

'Working Mother' magazine survey names MIT one of nation's best employers

■ By Sarah H. Wright
News Office

MIT has been named one of the "100 Best Companies for Working Mothers" by Working Mother magazine, sponsor of the nation's first and most widely recognized survey of organizational support for employee work/life issues.

The survey, begun in 1986, ranks companies on six criteria: child care, leave for new parents, flexible work arrangements, work/life benefits such as elder care and adoption assistance, and opportunities for women to advance.

This year's "100 Best Companies"

survey appears in the October 2000 issue of "Working Mother" Magazine. The article on MIT states, "MIT has worked diligently to make the university a better place for women." It also
(continued on page 5)

IN BRIEF

FACULTY MEETING

The Wednesday, Sept. 20 faculty meeting has been cancelled. The next meeting is scheduled for 3:30pm, Wednesday, Oct. 18 in Rm 10-250.

MIT Italy program is a hit with students

■ By Sarah H. Wright
News Office

The coordinators of the MIT Italy Program will lead an orientation in the West Lounge of the Student Center on September 19 from 6-8pm. Last year's participants will talk about their experiences working and living in Italy.

A recent addition to the MIT International Science and Technology Initiatives (MISTI), the MIT Italy Program was launched in 1999 following Prime Minister Massimo d'Alema's visit to campus. The program is sponsored by a grant from the Council on Italy and the US, as well as by a consortium of member companies including FIAT, FIAMM, Pirelli and Telecom.

Professor Richard Locke, Serenella Sferza and Sigrid Berka, program coordinators, will introduce the former participants and discuss the application process.

Describing the MIT Italy Program, Professor Locke, the Alvin J. Siteman Professor of Entrepreneurship and Political Science in the Sloan School, said, "It is an extremely innovative program, combining classroom study of Italian language, history, culture and politics with real-world experiences in the country. Italian companies are delighted to host our students and, based on our experience last year, MIT students seem to benefit tremendously from the program as well."

At the orientation, all aspects and requirements of the new program will be discussed. Refreshments will be provided. Interested students should bring their resume and should fill out an application form at <http://web.mit.edu/mit-italy/www> or e-mail Dr. Sferza at italy@mit.edu.

MIT students participating in the first year of the MIT Italy Program were placed in Italian companies, academic institutions and non-profits.

Bev Thurber, a junior majoring in math and humanities with a concentration in archeology, and Rebecca Hwang, a sophomore in

brain and cognitive sciences, did their own big dig this summer with the Footsteps of Man Cooperative. Ms. Thurber and Ms. Hwang set out to find new engraved rocks, trace the art and catalogue figures.

Kim Luu, who received her master's degree in environmental engineering in May, will spend four months on "How to Save the Venice Lagoon," a project established by Professor Paola Rizzoli of the Department of Earth, Atmospheric and Planetary Sciences. Ms. Luu works at the Council of National Research running a numerical sediment transport model of the lagoon to determine waste water pollution.

Commenting by e-mail from Venice, Ms. Luu wrote, "I came to Italy specifically because I fell in love with the country when I studied abroad here during undergrad. Also, I wanted to improve my Italian. I like the pace of life here and the little things, like bakeries and stopping by the vegetable boat on my walk home from work, instead of buying food to last weeks at a time at Star Market. I feel really lucky to be able to live here. I would definitely recommend international work experience."

The MIT Italy Program also supported the dissertation work of some graduate students in a variety of departments.

Tito Bianchi, a graduate student in urban planning, is pursuing his dissertation research in conjunction with the ISFORT research institute in Rome. Mr. Bianchi studies the transportation costs incurred by small enterprises in the nascent industrial districts of the Italian South. He will be in Italy for one year.

To prepare its interns, the MIT Italy Program sponsors a variety of language and culture courses, in particular, Italian I and II taught by Professor Daniele Benati.

Directed by Professor Suzanne Berger of MIT's Department of Political Science, MISTI already has highly successful internship programs in China, Germany, India and Japan, and next year will add France to the list.

Friends reminisce about Li's life

(continued from page 1)

A total of 664 students, faculty and staff registered with the National Marrow Donor Program (NMDP) as a result of the MIT efforts, none of them a complete match for Mr. Li. The two drives concentrated on testing Asians, Pacific Islanders, Africans, Hispanics, Native Americans and persons of mixed ethnicity because of the shortage of donors from those groups.

Mr. Li died of a lung infection in New York Hospital. The funeral was in Brooklyn on August 16. He is survived by his parents and a younger sister, all of whom live in Brooklyn.

"I hope we will keep his spirit alive in our hearts and in our dedication to fighting leukemia," said Susan Dacy, a graduate tutor at Burton Conner who helped coordinate both drives.

Residents of Burton 2 where he lived and other friends have been sharing memories of Mr. Li. Even after he left MIT, friends said Mr. Li kept himself busy and his brain challenged. He read Schopenhauer, Yeats and Dostoyevsky as well as *Angela's Ashes* and other contemporary fiction. He scoured magazines and newspapers and peppered his friends with ironic asides and interesting clips.

He converted the architecture of his home computer so he could access Athena more easily and communicate with his friends, and he searched scientific web sites to learn about an eclectic

variety of subjects—from jet turbines to cloning sheep.

Mr. Li learned the entire 18.03 (Differential Equations) curriculum on his own so he'd be eligible to take advanced courses when he returned to MIT. In addition, he wrote a retrospective novella reflecting on some of his first-term adventures and antics.

Here are some of his friend's recollections:

Joshua A. Goldwitz, a junior in mechanical engineering who occasionally traveled by subway to high school with Mr. Li and became closer to his fellow Brooklynite when they arrived at MIT: "Dave was always optimistic that he would return to MIT. He had no interest in going to school in New York where he had to remain for medical treatment. He was driven to continue learning and developing his mind even at home. He borrowed some of my textbooks and would also read other books and surf the Internet. When I went home for breaks, we would catch up and usually get dim sum in Chinatown."

Grant Kristofek, a junior in mechanical engineering, met Mr. Li during freshman orientation and shared a room with him. He remembers Mr. Li as friendly, bright and witty. "Nothing could escape the trap that was his mind. Dave was always thinking. He utilized his remarkable intellect to ace his intense first-term load, to shepherd me and other friends through those diffi-

cult social issues that freshmen face, to quip witty remarks that brought everyone around him to the floor with laughter, and more than anything, to keep himself from becoming bored. Until his last, I don't think Dave was ever bored. He wouldn't stand for it. His life was brief yet full of conviction, purpose, brilliance. His spirit will live on in all of us."

Daniel Kwon, Mr. Li's other roommate, a junior in aeronautics and astronautics, met him at the egg drop contest during orientation. In addition to Mr. Li's intelligence and wit, Mr. Kwon remembers him as a raconteur, a chef and a proud New Yorker. "A bunch of guys on the floor decided to make a Thanksgiving turkey to test our cooking skills. We each were assigned to contribute one food item. Well, it turned out that Dave basically ran the show, cooking the entire turkey, stuffing and all. It was one of my best meals at MIT. He loved New York; he loved riding the subway and showing me around Chinatown. It amazed me how much he knew and was interested in learning. He'd talk about quantum computers or M theory or neutrinos with so much hope that everything was feasible, it was just a matter of time."

Vijay Divi, a junior in electrical engineering and computer science, remembers Mr. Li's compassion and understanding. "He tried to understand the positions of each of his friends and helped all of them. Being one of the only people I could really talk to, he helped me through some of my toughest times my first semester at MIT." He, too, has fond memories of Thanksgiving in the dormitory. "We ate for hours, talked for hours and laughed for hours. The most amazing thing that I will forever admire Dave for is his altruistic personality. The most important idea he instilled in all his friends is the power of helping. He showed us how important it is to help those around us."



David Li (left) posed with one of his MIT roommates, Grant Kristofek, a junior in mechanical engineering.

Student Notices

* Open to public
** Open to MIT community only

INSTRUCTIONS: Listings for Student Notices should be submitted using the web form at <http://web.mit.edu/newsoffice/tt/calform.html>. If you have questions, please contact ttcalendar@mit.edu or x3-2704.

September 13-24

ANNOUNCEMENTS

Career Services and Preprofessional Advising Recruitment Presentations: Sept 13: Merrill Lynch/Investment Banking, Debt and Equity, Technology, and Asset Management, 6:30pm, Rm 4-163. **Sept 14:** Level 3 Communications, 7pm, Rm 4-149. **One Point Communications, 6:30pm, Rm 4-145. Sept 18:** Constellation Power Source, Inc., 5:30pm, Rm 4-149.

MIT-Germany Program Orientation*—Monday, Sept. 18. Professor Bernd Widdig, Dr. Aminia Brüggemann. Sponsored by MIT-Germany program. 6-8pm, Twenty Chimneys, Student Ctr. More info: x3-6982, sberka@mit.edu, <http://web.mit.edu/mit-germany/>.

Fall 2000 UROP Direct-Funding Deadline*—Friday, Sept. 22. Sponsored by UROP. 9am-5pm, Rm 7-103. More info: x3-7306, urop@mit.edu, <http://web.mit.edu/urop/>.

RELIGIOUS ACTIVITIES

The Chapel is open for private meditation 7am-11pm daily.

Baptist Campus Ministry—Weekly events:** Sunday Nights at the RAC, 6pm, Main Din-

ing Rm, Bldg W11. Home-cooked meal at 6pm (cost: by donation), followed by Bible study. Tuesday Vespers, 6-6:30pm, chapel. A quiet time for reflection. More info: x3-2328.

Baptist Student Fellowship*—Meets Tuesdays, dinner followed by Bible study, 5:30-7pm, Bldg W11, small dining room. Sponsored by Baptist Campus Ministry. More info: x3-2328.

Campus Crusade for Christ—Meets Wednesdays, 7:45pm, PDR 1 & 2, 3rd fl Student Center.** More info: x5-6204 or gnelson@mit.edu.

Chi Alpha Christian Fellowship—Weekly Organizational Meeting, Tuesdays, 7:30-9pm, PDR 3, Student Center.** Christian worship and examination of the Book of Revelation. Prayer and fasting Thursdays, 12-12:45pm in W11-063. More info: x3-2327, cacf@mit.edu <www.mit.edu/activities/xa/main/html>.

Christian Science Organization—Thursdays at 7pm.** More info: x3-8797 or lnorford@mit.edu.

Communitas-Life Together—Protestant worship Sunday, 11am.** Sponsored by American Baptist Church, United Church of Christ, United Methodist Church, Presbyterian Church (USA). Chaplain John Wuestneck, x2-1780 or chaplain@mit.edu.

Graduate Christian Fellowship—Meets Fridays at 6pm.** Also weekly Bible studies, prayer and volleyball. More info: <http://web.mit.edu/mitgcf/> or mit-gcf-info@mit.edu.

Lincoln Laboratory Bible Study*—Thursdays, 12-12:30pm, weekly Bible study in the Group 73 conference room, D-482. More info:

Sharon Frigon at 981-7751 or frigon@ll.mit.edu.

Lutheran-Episcopal Ministry at MIT*—Wednesday worship 5:10pm, followed by either brown bag supper or social activity in the Bldg W11 dining room. Second Sunday of each month, LEM assists at Common Cathedral, a gathering of homeless people on the Boston Common, 1pm. More info: x3-0108.

Meditation and Discourse on the Bhagavad Gita*—Swami Tyagananda, monk of Ramakrishna Mission of India and MIT chaplain. Fridays, 5:15pm, MIT Chapel. Sponsored by MIT Vedanta Society. More info: 661-2011, mehta@cytel.com or <http://www.cytel.com>.

MIT Hillel—Tuesdays: 5:30pm** Beg. Hebrew; 6:30pm Int. Hebrew. Wednesdays: noon Hebrew conversation table in Walker; 7pm Haftorah class. Thursdays: noon Taste of Torah. Fridays: 6pm Egalitarian Chavurah services and Orthodox Minyan services; 7pm Shabbat dinner. Saturdays: 9am Orthodox Minyan services; 12:45pm Shabbat lunch. More info x3-2982.

MIT Muslim Students Association*—Five daily prayers, Bldg W11; also Friday congregation 1:10-1:45pm, Rm W11-110. More info: x8-9285.

MIT Orthodox Christian Fellowship—Dinner Wednesdays, 5:30pm** in Student Ctr DR 1 followed by chapel Vespers. John Kymissis x5-7649 or Costa Sapuntzakis x5-7683.

Protestant Eucharist/Holy Communion*—Wednesdays, 5:10pm in Building W11. Sponsored by the Lutheran-Episcopal Ministry at MIT. More info: x3-2325 or lutheran@mit.edu.

Taize Prayers*—Fridays, 12-12:30pm in W11, the Board Room. All invited. Sponsored by students from the Protestant Ministry at MIT, Tech Catholics and the Lutheran-Episcopal Ministry. Taize Prayers are a form of Christian meditation based on singing and silence.

Tech Catholic Community—Sunday Masses 9:30am, 1pm and 5pm.** Weekday Masses Tuesday and Friday at 12:05pm when classes are in session. MIT Chapel. More info: x3-2981 or catholic@mit.edu.

United Christian Fellowship (UCF)—A member of** Intervarsity Christian Fellowship. Fridays, 7:15pm, 3rd floor of Student Center. More info: Sherry or Sara at 576-5157, mitucf@mit.edu, <http://web.mit.edu/ucf/>.

VOLUNTEERS

The MIT Public Service Center (PSC) has compiled the following volunteer opportunities. Please contact the PSC for more information (Rm W20-547, x3-0742).

Cambridge Youth Soccer seeks volunteers to coach soccer teams of boys and girls ages 8, 10, 12 and 14. Contact Tim Hughes at 868-5052 or te Hughes@hotmail.com for details.

Tutor/mentor an 8th grader in science and math. Located in Dorchester, but can come to MIT at least initially. Call Gay Harter at 354-3512 for info.

Associated Day Care Services of Cambridge has several volunteer openings in the classroom, at parent meetings, for readers and chaperones, and more. Call 695-0700 x250 for details.

MIT TECH TALK

(USPS 002157)

September 13, 2000
Volume 45, Number 5

Publisher
KENNETH D. CAMPBELL

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Director: Kenneth D. Campbell; Associate Director: Robert J. Sales; Assistant Directors: Donna Coveney, Elizabeth A. Thomson, Alice C. Waugh; Senior Writer: Sarah H. Wright; Science Writer: Deborah Halber; Assistant Editor of Tech Talk: Denise Brehm; Administrative Assistant: Myles Crowley; Design/Editorial Assistant: Lisa Damtoft; Administrative Secretary: Mary Anne Hansen; Senior Office Assistant: Patricia Foley.

The Arts page is produced by the Office of the Arts, Room E15-205, (617) 253-4003. Director of Arts Communication: Mary Haller; Administrative Staff Assistant: Lynn Heinemann.

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newsoffice@mit.edu

News Office URL:

<http://web.mit.edu/newsoffice/www/>

Office of the Arts URL:

<http://web.mit.edu/arts>

Tech Talk is published weekly except for most Monday-holiday weeks by the News Office, Room 5-111, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge, Massachusetts 02139-4307. Telephone: 617-253-2700.

Postmaster: Send address changes to Mail Services, Building WW15, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge, Massachusetts 02139-4307. Subscribers may call (617) 252-1550 or send e-mail to mailsvc@mit.edu.

Tech Talk is distributed free to faculty and staff offices and residence halls. It is also available free in the News Office and the Information Center.

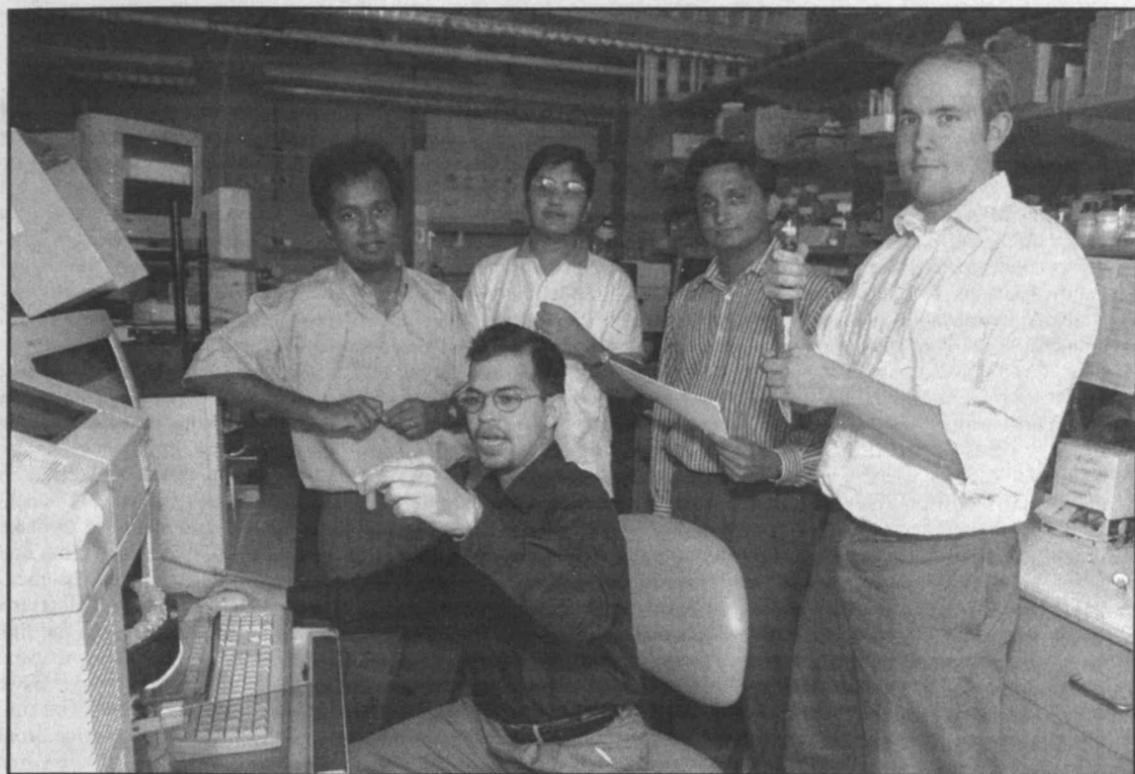
Domestic mail subscriptions are \$25 per year, non-refundable. Checks should be made payable to MIT and mailed to Business Manager, Room 5-111, MIT, 77 Massachusetts Avenue, Cambridge, MA 02139-4307.

Periodical postage paid at Boston, MA.

Permission is granted to excerpt or reprint any material originated in Tech Talk. Selected articles that originated here are also available online (see web URL above).



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Refining testing of the widely used drug heparin are researchers (standing left to right) Associate Professor Ram Sasisekharan, Division of Bioengineering and Environmental Health (BEH); BEH graduate student Rahul Raman; Ganesh Venkataraman, a research associate in the Harvard-MIT Division of Health Sciences and Technology; and BEH graduate student Zachary Shriver. BEH postdoctoral fellow Mallikarjun Sundaram is seated.
Photo by Donna Coveney

US News ranks MIT #5 university overall

#1 in undergraduate engineering
#2 in undergraduate management

■ By Deborah Halber
News Office

MIT is the #5-ranked national university, according to the 2001 US News and World Report guidebook, "America's Best Colleges."

US News ranks MIT first in undergraduate engineering programs in schools that offer engineering PhDs, and second for undergraduate business programs, following the University of Pennsylvania.

The guidebook, which hit newsstands September 4, names Princeton as the nation's top school. Harvard and Yale are tied for second place and the California Institute of Technology is #4. Caltech was #1 last year.

In an e-mail interview with The Tech, MIT President Charles M. Vest said, "It is very good that MIT continues to be rated as one of the handful of

institutions at the very top of all universities.

"However, as I have consistently stated for many years, the hair-splitting of actual rank ordering such disparate institutions is essentially meaningless. Indeed, the drop in MIT's position this year appears to be primarily because of a technical change in the way we report our research volume.

"MIT is guided by what our faculty believes to be the best curricula and institutional strategies, rather than by magazine rankings," he said.

Last year, MIT was ranked #3 after sharing the #4 ranking with Stanford University in 1998 and holding the #6 slot in 1997.

MIT is among the top schools in terms of campus racial and ethnic diversity, earning a diversity index of 0.65 (1.0 is the highest possible), partly because 30 percent of the student population is Asian American. It is also among schools with the highest graduation rates (91 percent) and highest proportion of classes with less than 20 students (70 percent).

METHOD OF RANKING

Best college rankings in the guidebook were determined by judging the academic quality of more than 1,400 schools based on a formula that relies upon objective data—such as freshmen retention and graduation rates, student-faculty ratio and class size—for 75 percent of the measurement. The remaining 25 percent is based on a reputational survey of university presidents, provosts and deans of admission.

Rankings for undergraduate business and engineering programs are based on ratings by deans and senior faculty of peer institutions in their disciplines. Other indicators used to capture academic quality were faculty salary; proportion of the faculty that is full time; proportion of professors holding the highest degree in their field; student selectivity; average spending per student on research, instruction and education-related services; and alumni giving rate.

More information is available on line at the US News and World Report web site <<http://www.usnews.com>>.

Tool impacts multi-billion dollar drug industry

■ By Elizabeth A. Thomson
News Office

MIT scientists and colleagues recently announced work that could impact the multi-billion dollar heparin industry and change how the FDA regulates that common anti-clotting drug. The work is the first application of a novel analytical tool announced by the same core group of researchers last fall. Other important applications promise to follow.

"Periods of great discovery in science are almost always preceded by the development of new tools," writes Professor Matthew A. Nugent of Boston University in the September 12 issue of the Proceedings of the National Academy of Sciences. His commentary accompanies two articles by the MIT researchers describing the heparin work.

versity of Iowa, Jawed Fareed of the University of Loyola and MIT Professor Emeritus Klaus Biemann of chemistry.

UNDERSTANDING HEPARIN

Heparin, a compound with a variety of important interactions within the body, is one of the most clinically important sugars. For example, doctors have used this compound in surgeries since 1935 to prevent blood clots that can cause strokes and heart disease.

In the work reported in the first PNAS paper, the researchers used the new tool to determine the sequence of a heparin fragment known to have anticoagulation activity and produced by a common technique. They got a surprise. Their results didn't agree with the sequence reported earlier

by other scientists. After re-checking the structure using other, more time-intensive tools, the new sequence stands.

The new sequence reveals that the heparin fragment produced by this particular technique contains only a partial active site, or area key to anticoagulation activity. And that, in turn, affects drug activity. The second PNAS paper proves this.

WIDER IMPLICATIONS

The work has even wider implications. Until now there's been no quick and easy way to determine the composition of heparin produced by any technique. The same is true for a newer generation of heparin products called low molecular weight heparin (LMWH). As a result, the strength of both drugs varies from manufacturer to

manufacturer, even from batch to batch. "So the MIT tool could change how the FDA will probably handle heparin," Dr. Venkataraman said.

Professor Sasisekharan emphasizes that commercially available heparin is still quite safe. Doctors have more than 50 years of experience in using the drug. "We're simply hoping to use this new tool to make the drug more consistent and hence better," Dr. Venkataraman said.

The team is currently working to make the technology commercially available. Patents are pending. "Our hope is that sugar sequencing will become as commonplace as for DNA and proteins," Professor Sasisekharan said.

The work is funded in part by the Arnold and Mabel Beckman Foundation, the NIH, and a Whitaker Health Sciences Fund Fellowship.

MYSTERIOUS WORLD

The new analytical tool probes the mysterious world of complex sugars. Although these compounds have recently been shown to play important roles in processes from viral infection to tissue development, "the field has lagged far behind the mainstream work on proteins and DNA," said Ram Sasisekharan, an associate professor in the Division of Bioengineering and Environmental Health (BEH) and leader of the MIT team.

That's because the complex sugars have many more building blocks than their better-known cousins, DNA and proteins, making them more difficult to study. The MIT tool is a quick, easy way to determine the structure, or order of building blocks, of these sugars (MIT Tech Talk October 20, 1999). "Once you have the sequence of building blocks for a given polysaccharide, you can start cracking its function in the body," said Professor Sasisekharan.

Similar sequencing techniques for DNA and proteins have been instrumental in shaping the biotechnology industry and have led to applications making those compounds household names. With the new tool, "we hope to articulate that these sugars are also fundamental to biology—that they're a new and important frontier," said Ganesh Venkataraman, a research associate in the Harvard-MIT Division of Health Sciences and Technology.

Authors of the PNAS papers are Professor Sasisekharan, Dr. Venkataraman, BEH graduate students Zachary Shriver and Rahul Raman, BEH Postdoctoral Fellow Mallikarjun Sundaram, Katherine Drummond and Jeremy Turnbull of the University of Birmingham (United Kingdom), Toshihiko Toida of Chiba University (Japan), Robert Linhardt of the Uni-

Three Nobel Prize winners to share podium

■ By Robert J. Sales
News Office

MIT's three Nobel Prize-winning economists will make a rare public appearance together when they deliver the inaugural Ford/MIT Nobel Laureate Lecture at 7pm Monday in Kresge Auditorium.

Professors Emeriti Paul A. Samuelson, Franco Modigliani and Robert M. Solow, who among them have spent 151 years on campus, will talk on "The US Economy: The Last 50 Years and the Next 50 Years." A question-and-answer period will follow their lectures.

MIT Video Productions will videotape, cablecast and webcast the program. The webcast may be accessed via the MIT Home Page on the day of the program.

The speakers will be introduced by Chancellor Lawrence S. Bacow and Dr. Martin B. Zimmerman, vice president for governmental affairs for the Ford Motor Co. The five-year program supported by a Ford Motor Co. grant will sponsor additional MIT appearances by Nobel laureates this academic year.

Professor Emeritus Samuelson joined the Department of Economics faculty in 1940. He won the Nobel Prize in 1970 for his work to raise the level of scientific analysis in economic theory, the first American to be so named for economics.

In 1948, Professor Samuelson authored the best-selling introductory textbook *Economics*, which has been translated into 40 languages and is still widely used. In addition, he has written *Foundations of Economic*

Analysis (1947, enlarged edition 1983) and five volumes of *The Collected Scientific Papers of Paul A. Samuelson* (1966-86). A sixth and seventh volume are planned.

Professor Modigliani came to the Sloan School of Management in 1960 as a visiting professor and was appointed to the faculty two years later. A native of Italy, he won the 1985 Nobel Prize in economics for his analysis of "life cycle savings."

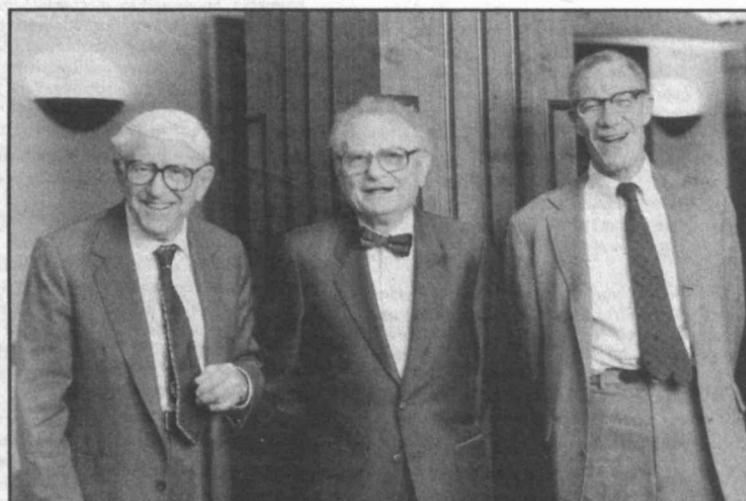
The author of 18 books, Professor Modigliani is an honorary president of the International Economic Association and former president of both the Econometric Society, the American Economic Association and the American Finance Association. He was

awarded the James R. Killian Faculty Achievement Award by MIT in 1985.

Professor Solow, who taught undergraduate courses in macroeconomics and other subjects for 47 years, joined the faculty in 1949. He received the Nobel Prize in economics in 1987 for his theory of growth.

Professor Solow has written numerous books, including *Capital Theory and the Rate of Return* (1963), *Growth Theory: An Exposition* (1970) and *The Labor Market as a Social Institution* (1990). He has collaborated on books with MIT professors Samuelson, Michael L. Dertouzos and Richard K. Lester.

Additional information is available at <<http://web.mit.edu/nobel-lectures>>.



MIT Nobel prize-winning economists (left to right) Franco Modigliani, Paul A. Samuelson and Robert M. Solow pose together in this photo taken a few years ago. The three will share the podium in Kresge Auditorium at 7pm on Monday in the first Ford/MIT Nobel Laureate Lecture.

Report concerns on animal care

Vice President for Research and Dean for Graduate Education David Litster and the chairman of the Committee on Animal Care are once again soliciting any information which would aid MIT's effort to maintain the humane care of animals used in research.

MIT's Committee on Animal Care (CAC) was established to ensure that all MIT researchers working with animals comply with federal, state, local and institutional regulations on animal care. To that end the CAC inspects animals, animal facilities and laboratories, and reviews all research and teaching exercises which involve animals before experiments are performed.

If you have information about inadequate animal care or treatment or any information that would help the CAC fulfill its responsibilities, please contact the CAC at x3-9436, or call Professor Litster at x3-6801.

All concerns about animal care will be handled confidentially and will be investigated by the CAC. The CAC will report its findings to anyone who has such concerns, as well as to the vice president for research and dean for graduate education.

Will man-made robots rise up and demand their rights?

(Portions of this article by Professor Rodney Brooks, director of the Artificial Intelligence Laboratory, originally appeared in the July 3, 2000 issue of *Time* magazine.)

The helpful little paper clip that watches as we type our reports and letters in the latest versions of Microsoft Word, second guessing us and correcting our errors, has a certain degree of native intelligence. (Indeed, it is the product of years of research in the field known as artificial intelligence.) But that doesn't mean we are likely to treat it with any intellectual respect; if it tooted its horn and started typing "I want to be able to vote for the next President!" we would click it out of existence without a second thought.

What would it take for us to treat seriously the demands of a computer program for equal rights? What if robots—which today we treat as virtual slaves—insisted that they were endowed with the same unalienable rights that humans enjoy, including the right to self-determination or the right to bargain over wages and working conditions?

Humans have a sad record in their willingness to grant equal rights across races, classes, religions and sexes. Our sense of tribalism has historically overridden our sense of fair play and justice. And those tribal feelings are especially strong when our sense of what makes us human—our feelings of self and specialness—are under attack, as they have been for the past few hundred years. Galileo paid dearly for challenging our erroneous belief that we are the center of the universe; Darwin's assertion that we are descended from mere animals is still reverberating through the intellectual badlands of America.

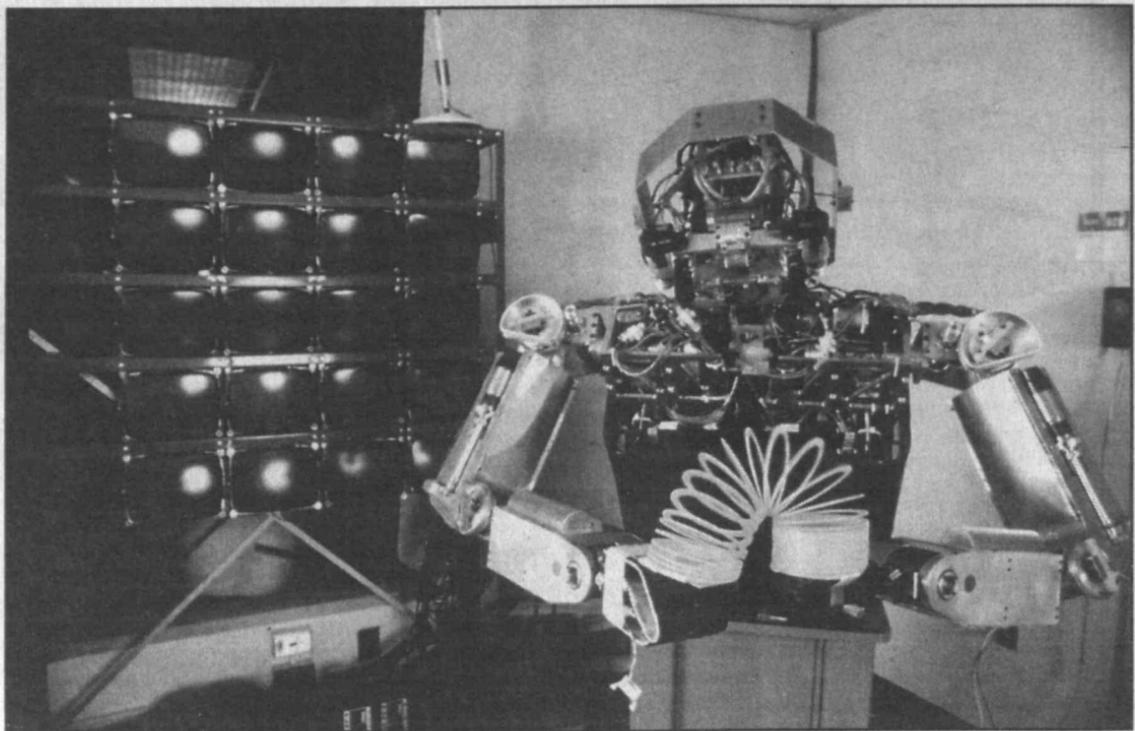
No wonder IBM in the sixties chose the reassuring slogan "Computers don't think, people do." By now, however, most of us realize that machines can reason, sort, search and even play chess better than any person. To maintain their sense of specialness, humans resort to name-calling, deriding machines for their soullessness, for their lack of real emotion, for their cold hard reason.

Before we (humans) will take seriously any request for equal rights from them (robots), we will have to be ready, in our hearts, to treat them as emotional, empathetic equals with the ability to share our own loves and anguishes. And robots will have to really want those rights. Popular culture loves to explore this theme, most recently through Commander Data, the Star Trek humanoid robot who wants an emotion chip, and Robin Williams' Bicentennial Man, a robot who wants the rights of a human citizen of the world.

But could a robot ever want anything? Could a robot have any real emotions? The hard-core reductionists among us, myself included, think that of course in principle this must be possible. We humans, after all, are machines made up of organic molecules, whose interactions can all be modeled by sufficiently large computers (we think). We are, then, just machines, perhaps with some funny randomness forced by quantum mechanics (a popular hideaway for theories of free will).

We human machines certainly want things and have real emotions. We even experience consciousness, although discussions of consciousness invariably fall into deep pits of confusion. This is largely because observation of conscious activity is such a solipsistic activity. We can never be sure that anyone else is experiencing anything remotely similar to what we all experience, and the question really gets murky when we try to extend it as far as our dogs, let alone our machines. But, in principle, it should be possible to build other machines, non-flesh machines, that want and feel. Under this line of reasoning, it just remains to be seen whether we humans are clever enough to build them.

Critics of such thinking fall into two camps. One group believes that there is something beyond the mere material in the make-up of things that live, variously articulated as a life force, a soul or a biological historical context. (In my opinion, the latter is just an artful dodge to avoid coming



This picture of Cog, a humanoid robot created by a team of researchers at the AI Lab led by Professor Rodney Brooks, was taken in March 1998. Cog is playing with a Slinky toy; the bank of computers to his right is linked to his vision.
Photo by Donna Coveney

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out and calling it an elixir of life.) The other group suggests that there are scientific principles that we do not yet fully understand, suggesting that the key to life or consciousness is perhaps quantum mechanics, or some previously unrecognized fundamental type, like mass in physics. (Again, the latter may as well be called an elixir of life.)

Scientists are genuinely divided on these issues, perhaps because we are at the nexus, much as in Darwin's time, where a great communal intellectual leap will be necessary for us to be able to relinquish one more claim to specialness that we as humans have held dearly—this time giving over to the view of ourselves as mere machines.

So how well are we doing in creating living, breathing robots? We are making progress. There are a lot of levels at which this question is being tackled, both from the bottom up (starting with the low level dynamics of life itself), and from the top down (exploring the high-level behaviors and capabilities that we expect from members of the human species).

In trying to build artificial living forms, researchers are taking apart the simplest living bacteria—mycoplasmas—whose genome can be stored in less than a quarter of a megabyte. The hope is to build new versions of living creatures by mixing and matching components from many different naturally

(continued on page 5)

Institute Calendar

* Open to public
** Open to MIT community only

(For arts-related listings, see page 7.)

INSTRUCTIONS: Seminars & Lectures must be submitted to the online Events Calendar at <http://events.mit.edu>. If you have questions about using that calendar, see the online help page, contact the I/S Computing Help Desk (Mac: x3-1101, PC: x3-1102) or e-mail <computing-help@mit.edu>.

Listings for Community Calendar should be submitted to the News Office using the form at <http://web.mit.edu/newsoffice/tt/calform.html>. If you have questions, contact <tcalendar@mit.edu> or x3-2704.

Events must be MIT sponsored and take place on the MIT campus or at an MIT affiliate (Draper Labs, Lincoln Laboratory, etc.).

Next deadline for all types of listings is noon Friday, September 15, covering events from Wednesday, September 20 through Sunday, October 1.

September 13-24

SEMINARS & LECTURES

WEDNESDAY, SEPTEMBER 13

A New Functional Test For Tumor Suppressor Genes*—Prof. George Klein, Karolinska Institute, Stockholm. Noon-1pm, Rm 68-180. Sponsored by Dept. of Biology. More info: <shuguang@mit.edu>.

The Creation and Evolution of the NRO**—Jeffery Richelson, Sr. Fellow, National Security Archive. MIT Security Studies Program Seminar. 12-1:30pm, Rm E38-615. More info: x3-0133, <llevine@mit.edu>, <http://web.mit.edu/ssp>.

Physical Oceanography Sack Lunch Seminar**—12:10-1:10pm, Rm 54-915. More info: x3-2437, <atherton@plume.mit.edu>, <http://puddle.mit.edu/~atherton/sack.html>.

THURSDAY, SEPTEMBER 14

Synapse Formation, Growth and Plasticity: Genetic Analysis at the Drosophila Neuromuscular Junction**—Aaron DiAntonio. CLM-Related Lunch Seminar. Sponsored by Center for Learning and Memory. 12pm, Rm E25-202. More info: x2-2485, <cynthiah@mit.edu>, <http://web.mit.edu/clm/>.

On the Vertical Propagation of Rossby Waves**—Constantine Giannitis. Sponsored by MIT Atmospheric Science Seminars. 4-5pm, Rm 54-915. More info: x3-0136, <ddlucas@mit.edu>, <www.paoc.mit.edu/MASSseries.html>.

FRIDAY, SEPTEMBER 15

Electron Thermal Transport in Tore Supra**—Prof. Wendell Horton, Institute for Fusion Studies, U. of Texas. PSFC Seminar. 4-5pm, Rm NW17-218. More info: x3-8101, <rivenberg@psfc.mit.edu>, <http://www.psf.mit.edu/>.

MONDAY, SEPTEMBER 18

Flight of Imagination: Team Building with the Gossamer Albatross*—Dr. Morton Grosser. Sponsored by aero/astro. 2-3:30pm, Rm 33-114. More info: x3-4926, <jennie@mit.edu>.

Solutions to the Maxwell-Einstein Equations**—N. Zipser, MIT. Differential Geometry Seminar. 4-5pm, Rm Room 2-146. More info: x3-4057, <tian@math.mit.edu>, <http://www-math.mit.edu>.

Ford/MIT Nobel Laureate Lecture Series: The US Economy: The Last 50 Years and the Next 50 Years**—Profs. Franco Modigliani, Paul Samuelson and Robert Solow. Sponsored by Campus Activities Complex. 7pm, Kresge Auditorium. More info: x3-3913, <nobel-lectures@mit.edu>, <http://web.mit.edu/campus-activities>.

TUESDAY, SEPTEMBER 19

Innovations in Nanotechnology (Day One)**—Featuring MIT faculty and researchers. Sponsored by mechanical engineering, Office of Corporate Relations/ILP. 8:30am-5pm, Kresge Auditorium. More info:

x8-9419, <maupin@ilp.mit.edu>, <http://ilp.mit.edu/ilp/conferences/current.html>.

The Culture of Improvement: Cheese and Change in a Millenium of Technology**—Robert Friedel, Univ. of Maryland. Dibner Institute Luncheon Colloquium. 12-2pm, Rm E56-100. More info: x3-6989, <kontoff@mit.edu>.

Quest for Superfluidity in an Optically Trapped Fermi Gas**—John Thomas, Duke Univ. Modern Optics and Spectroscopy. Sponsored by Research Lab of Electronics, Spectroscopy Lab. 12-1pm, Marlborough Lounge Rm 37-252. More info: x3-4881, <hearn@mit.edu>, <http://web.mit.edu/spectroscopy/www/>.

Fluid Buckling**—Prof. L. Mahadevan. Sponsored by Fluid Mechanics Seminars. 4-5pm, Rm 3-133. More info: x3-2021, <dwilker@mit.edu>.

WEDNESDAY, SEPTEMBER 20

Innovations in Nanotechnology (Day Two)**—Featuring MIT faculty and researchers. Sponsored by mechanical engineering, Office of Corporate Relations/ILP. 8:30am-12:30pm, Kresge Auditorium. More info: x8-9419, <maupin@ilp.mit.edu>, <http://ilp.mit.edu/ilp/conferences/current.html>.

Ethnic Conflict**—Chaim Kaufmann, Lehigh Univ. MIT Security Studies Program Seminar. 12-1:30pm, Rm E38-615. Info: x3-0133, <llevine@mit.edu>, <http://web.mit.edu/ssp>.

Distinguished Speaker Series in High Performance Computation for Engineered Systems**—Christos Papadimitriou, Univ. of California at Berkeley. Sponsored by Singapore-MIT Alliance. 4-5pm, Rm 1-190. More info: x3-8122, <patera@mit.edu>, <www.mit.edu/sma>.

Number Walls in Combinatorics**—Michael Somos, Cleveland State Univ. Combinatorics Seminar. 4:15-5:30pm, Rm 2-338. More info: x3-6544, <sara@math.mit.edu>, <http://www-math.mit.edu/~combin>.

Growing Up Among Worlds: Where Do You Call Home?*—Professor Isabelle de Courtivron, Melissa Edoh '02, Toh Ne

Win '02, Madleina Scheidegger '03, and Josiah David Seale '02. Sponsored by Women's Studies Program, Center for Bilingual/Bicultural Studies. 7:30-9:30pm, Rm 4-231. More info: x3-2642, <mosh@mit.edu>.

THURSDAY, SEPTEMBER 21

Elegance and Accident**—Bill Shannon, interdisciplinary performance and media artist. Sponsored by Office of the Arts. 12-1:30pm, Kresge Auditorium. More info: x3-8089.

What Kind of Category is 'The Social' in Historical Analysis?*—Mary Poovey, NYU. Humanities Workshop Series, sponsored by History office. 4:30-6pm, Rm E51-275. More info: x3-4965, <history-info@mit.edu>, <http://web.mit.edu/history/www>.

Public Intellectuals: The Cyberspace Generation**—Jeff Bates, Slashdot; Stephen Duncombe, NYU; Annalee Newitz, Bad Subjects. Communications Forum. 5-7pm, Bartos Theater, Media Lab. More info: x3-3144 or x3-3521, <seawell@mit.edu>, <http://media-in-transition.mit.edu>.

COMMUNITY CALENDAR

Reception and Launch of Aero/Astro Learning Laboratory for Complex Systems**—Wednesday, Sept. 13, 5:30-7:30pm, Building 33. Hosted by Alexander d'Arbeloff, featuring interactive displays, tours, student presentations, and official launch of the Arthur and Linda Gelb Laboratory and Robert C. Seamans, Jr. Laboratory. More info: <kathi@mit.edu>.

Keys to Empowering Youth*—Register now for Saturday, Oct. 14, 9am-4pm, MIT campus. 11-13-yr-old girls spend the day at MIT with college mentors. Activities include polymer processing lab, presentation by Mr. Magnet and a career-life game. Sponsored by MIT Public Service Center. Info or to and registration: x3-0742 <priyraj@mit.edu>.

Working Group on Support Staff Issues**—Thursday, Sept. 21, 11:45am-1:30pm, Rm 10-105 (Bush Room). First meeting of the academic year; agenda posted at <http://web.mit.edu/committees/index2/html>. All

MIT support staff and administrative staff invited. Send e-mail to Olga Parkin <toxop@mit.edu> if you want to attend. More info: x3-6792.

MIT Libraries Booksale**—Thursday, Sept. 21, 10am-3pm, Dewey Library Plaza, rain or shine. Reasonably priced books in economics, management, political and social science. MIT Community only. All proceeds benefit MIT Libraries' Preservation Fund. More info: x3-5693 or <gifts-lib@mit.edu>.

Spouses and Partners@MIT Group**—Sept. 13: Q&A for newcomers. Sept. 20: Trip to George's Island. Meet at MIT Coop in Kendall Sq. at 1pm. \$7/person. Meetings take place Wednesdays 3-5pm in W20-400 unless otherwise noted. Childcare provided. More info: x3-1614 or <http://web.mit.edu/medical/spousesandpartners>.

MITAC

The MIT Activities Office (MITAC) serves the cultural and recreational needs of the MIT community, including retirees. Two locations: Walker Memorial, Rm 50-005, 10:30am-4:30pm, Wednesday-Friday; and Lincoln Lab, Rm LL-B-210, noon-3pm, Thursday and Friday only. More info: x3-7990, <dstavir@mit.edu>, <http://web.mit.edu/oscs/mitac>. MITAC accepts cash, checks and MasterCard and Visa (\$20 minimum). MIT IDs must be presented.

King Richard's Faire, through Oct. 22. South Carver. Tickets: \$16/adult (reg. \$20).

Joyful Noise Coffeehouse presents Richard Shindell, Sat., Sept. 16, 8pm. First Baptist Church, Lexington. Tickets: \$13 (reg. \$15).

Boston Classical Orchestra, Fri., Sept. 22, 8pm. Faneuil Hall. Tickets: \$13 (reg. \$18).

Topsfield Fair, Sept. 30-Oct. 9. Tickets: \$5.50 (reg. \$7/weekdays and \$8/weekends). Children under 8 free. Purchase by Sept. 28.

Dead End, Thurs., Oct. 5, 7:30pm. Huntington Theatre, Boston. Tickets: \$32 (reg. \$36). Purchase by Sept. 22.

Side Man, Fri., Oct. 6, 8pm. Lyric Stage, Boston. Tickets: \$20 (reg. \$32-36). Purchase by Sept. 22.

Forum planned on Wen Ho Lee case

A forum on the Wen Ho Lee case entitled "Spy of the Century?" will take place tomorrow (September 14) in Rm 4-231 from 7-8:30pm. Graduate student Roger Hu, who worked with Dr. Lee's defense committee in Fremont, CA, will be the moderator. A 60 Minutes story on the case will be shown.

Dr. Lee, a Taiwanese-American scientist at the Los Alamos National Laboratory who has spent nine months in jail, agreed over the weekend to plead guilty to one felony count of improperly retaining classified nuclear weapons data. As part of the plea bargain, the government reportedly agreed

to drop 58 other charges against Dr. Lee, whose supporters said he was being singled out because he was of Chinese descent. Initially, Dr. Lee was investigated on charges that he spied for China, but when he was arrested the charges involved downloading data about weapons secrets with the intention of harming the United States.

A federal judge in Albuquerque will rule on whether to accept the plea arrangement, once attorneys for both sides hammer out unspecified details. In the interim, Dr. Lee, who agreed to cooperate with the government as part of the plea bargain, remains in jail.

Conference explores future possibilities for robots

(continued from page 1)

just as the first computers came into the home as games, robots are making inroads as toys like Furbies and Aibo (Japan's robotic dog). Professor Brooks, who is also chairman of iRobot Corp., noted that a robotic baby, complete with facial expressions and moods, will be on the market soon (it was developed by iRobot and Hasbro).

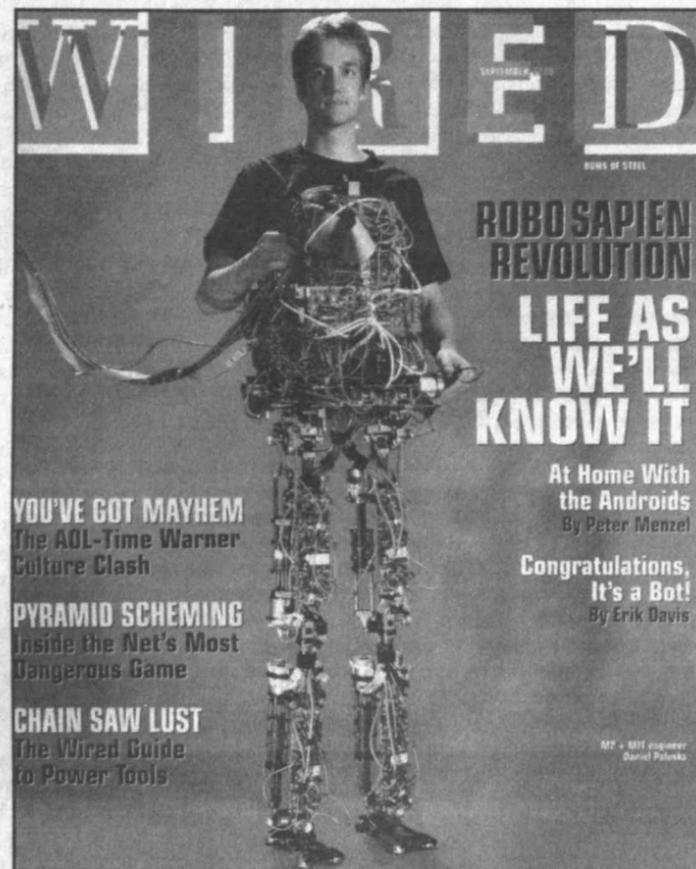
"Building things as toys pushes down prices, allowing entrance into the home. So we'll see more robotic toys," predicted Dr. Brooks, the Fujitsu Professor of Computer Science and Engineering.

How will robots affect our everyday lives? For one, "we will become used to having autonomous and semi-autonomous mobile devices in our daily interactions," Professor Brooks said. We'll also interact with systems that have some sort of emotional content.

"We have some vague notions of how robots will be used," he said, but as with the early computers, "we're probably completely wrong about how they'll be used in 20 years."

An AI Lab open house following the talks by Professor Brooks and colleagues included demonstrations of Cog, a humanoid robot with torso and head, MIT Leg Lab robots like M2, and a variety of robots from outside MIT (yes, Aibos really do behave like puppies).

The two-day Humanoids2000 conference also featured technical talks and posters. It was sponsored by the Institute of Electrical and Electronics Engineers.



'Working Mother' magazine names MIT to list of top 100 workplaces in the nation

(continued from page 1)

notes the increase in numbers of women faculty; expansion of on-site child care resources, and MIT's official recognition by President Clinton for its actions on behalf of gender equity.

Laura Avakian, vice president for human resources at MIT, commented, "We are excited to be in the company of America's most progressive companies in terms of support for women and families. Our participation in this survey not only gives us an opportunity to celebrate our successes; it also permits us to benchmark our practices against the very best. It raises the bar for all of us and America's working women are the beneficiaries."

Kathy Simons, co-director of the MIT Family Resource Center, added, "MIT is the only university on this

year's list and just the second to have made the list in 15 years. The award reflects the work of a great number of people across the institute. Material for MIT's application was provided by over 50 offices and programs that are involved with work/life services on an ongoing basis. Analysis of this and other material helps us see what we've accomplished and what still needs to be done."

Commenting on the winners as a group, Working Mother's Editor in Chief Lisa Benenson said, "This year's competition was tougher than ever. To make this year's list, businesses has to be more creative and proactive in finding ways to accommodate their employees' work/life needs. For this, their commitment and ingenuity are to be commended."

Student makes cover of Wired magazine

What's it like to be on the cover of a national publication like Wired?

"Fun, but also very surreal," said mechanical engineering graduate student Dan Paluska, who is featured in the September 2000 issue of the magazine with M2, the two-legged humanoid robot he's developing. "You know how at carnivals there are those booths that produce a picture of you on a magazine cover? That's kind of how

I feel."

Most of the people who've contacted him about the cover have been old friends from high school. But he's also gotten a call from the producer of a documentary about robotics, and from someone trying to sell him a plaque of the cover.

And then there's the man who visited Boston on Monday, picked up a copy of the magazine, and tracked Dan down to get it autographed. He succeeded.

Will robots demand rights? Brooks ponders possibility

(continued from page 4)

occurring bacteria so that we can fully understand the process of life down to a molecular level.

Meanwhile, by building computer programs that reproduce and evolve, using so-called evolutionary algorithms, researchers are able to demonstrate the emergence of many of the abilities and behaviors that we expect from simple living creatures, such as interaction with a complex environment and sexual reproduction. Inside computers artificial life forms have already evolved that can locomote, chase prey, evade predators and compete for limited resources. Some researchers speculate that this line of research will let us build truly intelligent robots without having to figure out all the details ourselves.

At the other end of the living robot endeavor there has been a renaissance of interest in building humanoid robots. In Asia, Europe and North America, teams of researchers are designing robots that walk like humans, talk like humans, detect human faces and understand their voices, have human-like reflexes, emotions and the beginnings of human social responses.

This has always been the ultimate dream of artificial intelligence researchers, as well as the fantasy of science fiction writers. However, the robots we are building today still can't tell the difference between a vacuum

cleaner and an ironing board, don't have the physical dexterity of a one-year-old baby, and don't yet recognize that they are the same robot today that they were yesterday. At best today's humanoids are zombies stuck in the present, surrounded by a sea of faces and unrecognizable shapes and colors. Their social interactions with people are recognizable as social in nature, but ask them a question outside their pre-programmed fields of expertise and they fall apart.

Still, these interactions are remarkably more advanced than just three years ago. The direction is clear. Robots in research laboratories are becoming more human-like. Barring a complete failure of the mechanistic view of life, these endeavors will eventually lead to robots that we will want to treat as ethically as we treat animals, and ultimately as we treat fellow humans.

But we should not forget that we will also want robots to man the factories and do our chores around the house. We do not have ethical concerns about our refrigerators working 24 hours a day, seven days a week, without a break or even a kind word. As we develop robots for the home, for hospitals, and for just about everywhere else, we will want them to come similarly free of ethical issues.

So expect to see multiple species of robots appearing over the next few years. There will be those that will be our appliances, and those that will feel more and more empathy toward. One day the latter will call our bluff, and ask us to treat them as well (or as badly) as we treat each other. If they are unlucky, their prayers might just be answered.

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Classified Ads

Tech Talk ads are intended for personal and private transactions between members of the MIT community and are not available for commercial use. The Tech Talk staff reserves the right to edit ads and to reject those it deems inappropriate.

INSTRUCTIONS: Ads are limited to one (or about 30 words) per issue and may not be repeated in successive issues. Ads may be re-submitted after skipping a week. Ads/renewals are not accepted via telephone or fax. All must be accompanied by full name and extension (or proof of MIT affiliation).

- E-mail address (return address must be mit.edu): <ttads@mit.edu>
- Interdepartmental/Walk-in address: Calendar Editor, Rm 5-111.

Please note that all Tech Talk ads are provided to the Internet on the date of publication, which makes them accessible world-wide.

All extensions listed below are campus numbers unless otherwise specified, i.e., Dorm, Lincoln, Draper, etc.

MIT-owned equipment may be disposed of through the Property Office.

Deadline is noon Friday before publication.

FOR SALE

3 pair golf shoes, 2 M's sz 7 and 9, 1 L's sz 8, gd cond, \$5/ea or all 3 for \$10. Don 978-692-4764 days, 978-957-2774 after 5pm.

GE hvy-duty washer & dryer, \$100/pr, \$60/ea; 1978 Howard studio upright w/storage bench, \$1000; treadmill, barely used, \$260 (\$527 new); SCUBA Poseidon regulators & BCs, Mark, Linc x2914.

Sansui Model 2000 amp/rec, Yamaha surround sound amp, Audio Source 10 band graphic equalizer, ADC Sound Image spkrs, Realistic Minimus-7 spkrs, \$275/all. Contact 978-640-3935.

Beaut Carlos acoustic guitar, \$45 (bought for \$125); Pier 1 rattan mini-sofa, 36" h, 22" d, 60" l, \$40; new

Placewares white narrow shelving "tower," 72" h, 9" d, 13" w, 7 shelves, \$50. Call: 617-924-8950.

Refrigerator, 5.5 cu ft w/sm freezer, good & clean, no smell, no rust, suitable for student room, \$35. Chuck 617-484-8172, <ccc@space.mit.edu>.

HP external CD-Writer Plus 8210E, brand new, still in box, 6X read, 4X write, 4X rewrite, data, photos, video, music, \$100. Andrew x3-8362.

2 twin beds, exc cond w/elec blankets & pads incl, \$275; Ethan Allan secy desk, like nw, orig \$750, sell for \$250; matching chr, \$65; several capt chairs. Call 617-332-8251.

VEHICLES

1984 Oldsmobile Delta 88, 4-dr sedan, auto, power everything, 111K, used daily, has recent Mass. sticker, runs gd, like new, velour int, ask \$800. Jack 617-484-1563 eves 6-8pm.

1985 Saab 900, 170K mi, passed MA inspection on 4/00, driven daily, \$1400. Contact: Linc x1200 or <Benkert@LL.mit.edu>.

1986 Chevy Nova, 4-dr, A/C, auto, tan, gd city car, little rust, gd int, dented fender, \$675 or bst. Email <samajane@mit.edu>.

1989 Mazda 323 SE, 5-sp hatchback, 115K mi, orig ownr, black w/gray int, \$1500. Contact: <fouter@alum.mit.edu>, 781-861-6903.

1990 Mitsubishi Mirage 4-dr, 86K mi, auto, A/C, ps, pb, AM/FM stereo, \$2200. Call 617-965-2099 after 4pm.

1991 Honda 4WD 4-dr wgn (Civic), 6-sp manual, ps, pb, AM/FM/cass, real-time 4WD, 95K, 1 ownr, well-maint, new clutch, \$4995. Contact x3-4237 or <gsfs@mit.edu>.

1991 Buick Riviera, 3.8L V6, 96K mi, leather, all power, alarm, remote, tape/CD, orig ownr, new brakes, all records, perf cond, \$5500 or bst. Nancy 508-870-1557, <dall1938@aol.com>.

1992 Dodge Grand Caravan, exc cond, 56K, auto, fr A/C, AM/FM/cass, ABS, built-in child seats,

tinted windows, nw tires, batt, transm, \$7800. Contact 781-981-2858 or <tsai@LL.mit.edu>.

1992 Dodge Caravan, exc cond, 7 seats, A/C, ps, V6 3.0L eng, 101K mi, reg svc, owned 2.5 yrs, retailer wd ask ~\$4,900, ask \$3,800. Contact: 508-289-3563, <psalles@mit.edu>, <psalles@whoi.edu>.

1995 White Dodge Intrepid, grt cond, cc, pw, pl, 103K miles, worth \$5500 but will sell for \$3,999 (need minivan). Tammy Santora x3-0372.

1995 Toyota Camry LE, 4-dr, auto, A/C, ps/pb, pw, pl, pm, cc, AM/FM/cass stereo, 82K mi, exc cond, dependable, economical, \$9700. Call Draper x8-4008 days, 978-474-0357 eves.

HOUSING

Cambridge: furn rms in single home, walk to Draper, MIT, subway, \$250/wk, \$875/mo, \$75/night, prkg extra. Jan Blair, Draper x8-2843 or 617-576-5125.

Somerville: 3 apts, all nr T: 1BR, \$800 incl utils; 7 rms, \$1100 + utils, avail 10/1; 4 rms, \$850 + utils, avail 10/1. Tony 666-8770.

Wellfleet, Cape Cod: fully-equipped, comf 2BR cottage, slps 5, on priv rd, scenic marsh, close to bay beaches, bike trails, cable/VCR, fplc, deck, BBQ, avail wks in the fall, call for prices, 617-332-7104.

WANTED

3BR furn apt wanted nr public transp, pref covered prkg, for visiting faculty & fam 1/01/01-6/01/01, Camb, Brookline, Boston, Somerville, Arlington, Watertown, Lexington areas. Call x3-1879.

1BR apt wanted on Red Line in Cambridge, Somerville, Arlington for single, mature FMIT admin asst, no pets, non-smkr, sunny, clean room(s) in quiet nrhd. Contact x3-8433.

Many bookcases wanted, solid wood, over 7' high. Call x8-7372 or 781-729-4591.

Live-in pet-sitter will keep your pets in good cheer while you are away; mature, experienced, exc refs, avail all of Sept and Nov, must be nr T. Contact: <hoag@mit.edu>.

It's a fact

MIT's student newspaper, The Tech, was established in 1881 and has been published continuously since then.

Corporation committee awards tenure to 23 faculty members

The Executive Committee of the MIT Corporation has approved the awarding of tenure to the following faculty members, effective July 1, 2000 unless otherwise noted:

Dr. Akintunde I. Akinwande of the Department of Electrical Engineering and Computer Science has been promoted to associate professor with tenure. With research interests in emissive flat panel displays and vacuum microelectronics, Professor Akinwande aims to build flat panel displays that are smarter, lighter, brighter, more energy efficient and more integrated with computing and communications and that have high information content. In addition to helping provide a strategic industrial asset to the United States in the display arena, he also is a leader in the international technical community. He was a research scientist at Honeywell Inc. and an assistant engineer at Pulse Telecommunications Ltd. before joining MIT as an associate professor in 1995. He has been the ITT Career Development Associate Professor of Electrical Engineering since 1997. Professor Akinwande earned a BS from the former University of Ife (now Obafemi Awolowo University) in Nigeria in 1978, and the MS and PhD from Stanford University in 1981 and 1986, respectively.



Akinwande

Dr. Stephen P. Bell of the Department of Biology has been promoted to associate professor with tenure. He is a leader in studies of chromosome replication and cell-cycle control. He discovered and purified a complex of six proteins (ORC) that specifically recognizes origins of replication in the yeast *S. cerevisiae* and demonstrated that ORC is essential for chromosome duplication in this organism. His recent work on the role of ORC derived from the fruit fly *D. melanogaster* has provided a critical first step in determining the role of sequence-specific binding by ORC in higher eukaryotes. Dr. Bell was appointed an assistant professor at MIT in 1994 and was promoted to associate professor in 1998. He earned the BA from Northwestern University in 1985 and the PhD from the University of California at Berkeley in 1990. He received the Everett Moore Baker Memorial Award for Excellence in Undergraduate teaching in 1998, the first year he taught 7.28 (Molecular Biology).



Bell

Dr. Duane S. Boning of the Department of Electrical Engineering and Computer Science has been promoted to associate professor with tenure. Also associate director of the Microsystems Technology Laboratories, Professor Boning, who has been called an international leader in semiconductor manufacturing technology, specializes in spatial/temporal variation in manufacturing processes. He focuses primarily on chemical mechanical polishing (CMP) and plasma etching. He and his students developed test masks and models for CMP planarization widely used by the semiconductor industry. He works with the Leaders for Manufacturing Program to supervise internships and research in semiconductor, electronics and other areas of manufacturing. Before joining the MIT faculty as an assistant



Boning

professor in 1992, he earned an SB in electrical engineering and in computer science in 1984, an MS in 1986 and PhD in 1991, all from MIT.

Dr. John G. Brisson II of the Department of Mechanical Engineering has been promoted to associate professor with tenure. Professor Brisson earned the BE from Stevens Institute of Technology (1981), and the MS (1983) and PhD (1990) from Harvard University. He worked as a postdoctoral associate at Los Alamos Laboratories before joining the MIT faculty in 1993. He was promoted to associate professor in 1999 and was awarded the mechanical engineering department's Den Hartog Distinguished Educator Award that same year. Professor Brisson is known for his major contributions to the physics and technology of low-temperature engineering. His particular research interest is in cryogenics, especially sub-Kelvin refrigerators. Two of his designs have brought about a new class of high-efficiency, low-cost, small-size refrigerators that have made a major impact on industry. His current research is in microengines and small cryocoolers.



Brisson

Dr. Anantha P. Chandrakasan of the Department of Electrical Engineering and Computer Science has been promoted to associate professor with tenure. Professor Chandrakasan's depth of understanding, breadth of knowledge, original thinking and creativity have been called unparalleled in the field of digital integrated circuits. He has focused on developing design methodologies and tools for energy efficient computing and implementing distributed wireless sensors and multimedia systems. Perhaps the best known of his achievements is the use of embedded power supplies where the supply voltage of a processor can be adapted on demand. Before joining MIT as an assistant professor in 1994, he earned a BS (1989), MS (1990) and PhD (1994) from the University of California at Berkeley.



Chandrakasan

Dr. Dora Costa of the Department of Economics has been promoted to associate professor with tenure. She earned the BA from the University of California at Berkeley in 1986 and the MA (1988) and PhD (1993) from the University of Chicago. She joined the MIT faculty as an assistant professor in 1993 and was promoted to untenured associate professor in 1997. Dr. Costa's research interests are in American economic history, labor economics and economic demography, with a focus on the economics of aging, retirement and labor force participation. She is the author of numerous research papers and a book, *The Evolution of Retirement: An American Economic History, 1880-1990*.



Costa

Dr. Julie O.B. Dorsey of the Department of Architecture has been promoted to associate professor with tenure, effective November 1, 1999. Professor Dorsey fills a position unique to MIT; she is associate professor of architecture and computer science and engineering. Trained as both an architect and a computer scientist, she specializes in computer graphics and focuses on developing algorithms for

modeling and visualizing phenomena of interest to architects, lighting designers, visual artists and building scientists. She holds the BArch and BS in Architectural History (1987) and the MS (1990) and PhD (1993) in Computer Science, all from Cornell University. Her awards and fellowships include a National Science Foundation Faculty Early Career Development Award, an Alfred P. Sloan Foundation Research Fellowship, and the MIT Harold E. Edgerton Faculty Achievement Award. Professor Dorsey joined the MIT faculty in 1994 and was promoted to associate professor in 1997.



Dorsey

Dr. Elfatih A.B. Eltahir of the Department of Civil and Environmental Engineering has been promoted to associate professor with tenure. Professor Eltahir attained national and international preeminence through his work on the physical processes that drive the Earth's hydrologic cycle. His research interests revolve around the effects of large-scale land use change such as deforestation on local, regional and global climate. His latest work focuses on the dynamic non-linear relationship between the biosphere and climate. His work coupling surface conditions with meteorology has been hailed as "precisely what was lacking in most prior work in this area." Professor Eltahir earned a BS in civil engineering from the University of Khartoum in 1985, an MS in hydrology from the National University of Ireland in 1988 and SM and SD degrees in meteorology and in hydroclimatology respectively, both from MIT in 1993. He has received the Presidential Early Career Award and is editor of a journal in his field.



Eltahir

Dr. Edward Gibson of the Department of Brain and Cognitive Sciences (BCS) has been promoted to associate professor with tenure. He was named an assistant professor in BCS in 1993 and associate professor in both the Department of Linguistics and Philosophy and BCS in 1997. Dr. Gibson is a psycholinguist who studies human sentence comprehension. His major contribution is a theory that sentence processing has two major components: an integration cost component and a memory cost component. This theory explains why sentences like the one that you are reading right now, whose dependencies between words are distant in some cases, are difficult to understand, and why sentences with closer dependencies are much easier to understand. He has also shown that key effects in sentence processing cut across languages and thus reflect basic properties of a universal language-processing system. Dr. Gibson holds the BA (1985) from Queen's University, the MPhil (1986) from Cambridge University and the PhD (1991) from Carnegie-Mellon University.



Gibson

Dr. Hugh Gusterson of the Anthropology Program and the Program in Science, Technology and Society has been promoted to associate professor with tenure. Professor Gusterson's research focuses on the fields of science studies and peace and security studies. His first book, *Nuclear Rites*, considers the moral worlds of

weapons scientists at the Livermore Laboratories and their opponents in the anti-nuclear movement. His second book will examine the evolution of nuclear weapons laboratories since the end of the Cold War. Professor Gusterson has been commended for excellent teaching at the undergraduate and graduate levels; he teaches subjects on war, drugs, ethics and science, and technology and culture, among others. He received the BA from Cambridge University in 1980; the MSc from the University of Pennsylvania in 1982, and the MA and PhD from Stanford University in 1986 and 1992, respectively. He came to MIT in 1992 as assistant professor and was promoted to associate professor in 1996.



Gusterson

Dr. Douglas P. Hart of the Department of Mechanical Engineering has been promoted to associate professor with tenure. Professor Hart, the d'Arbeloff Career Development Professor, works in the field of fluid mechanics, where he has made major contributions that have changed the productivity of industry and direction of research in both optical flow diagnostics and tribology. He is the inventor of long-wearing textured seals for industrial applications that have allowed equipment to operate significantly longer in abrasive environments. In optical flow diagnostics, the fast correlation algorithm he invented—and a variation of it—are now used extensively in both commercial systems and university-developed particle image velocimetry (PIV) systems and are the basis for a new type of video-rate three-dimensional imaging system. He received the Keenan Award for Innovation in Undergraduate Education and the Junior Bose Award for Excellence in Teaching. He earned the BSc from the University of Illinois (1983), the SM from MIT (1985) and the PhD from the California Institute of Technology (1992). He joined the faculty in 1993.



Hart

Dr. Amos Lapidoth of the Department of Electrical Engineering and Computer Science has been promoted to associate professor with tenure. Professor Lapidoth, a member of the Laboratory for Information and Decision Systems, is an expert on communications theory and information theory. His research has involved fundamental limits on reliable communication under channel uncertainty. His contributions include existence theorems and efficient algorithms for universal receivers; the theoretical importance of both have since been widely acknowledged. Professor Lapidoth received the BSc in electrical engineering and the BA in mathematics (both summa cum laude) in 1986, and the MSc in electrical engineering (1990) from Technion University in Israel. He received the PhD in 1995 from Stanford University. He joined the MIT faculty that same year.



Lapidoth

Dr. Steven B. Leeb of the Department of Electrical Engineering and Computer Science (EECS) has been promoted to associate professor with tenure. Professor Leeb, the Carl Richard Soderberg Associate Professor in Power Engineering, has created several innovative courses: a departmen-

tal course in mechatronics, an IAP course called "Make a Motor" and a freshman seminar on designing a go-cart. His research contributions in power electronics range from monitoring electrical loads in buildings to modulating the arc in fluorescent lamps to transmit information. He received the 1999 IEEE Outstanding Young Power Electronics Engineer Award, the 1999 TR100 Young Innovator Award and was a finalist for the 2000 Discover Magazine award. He has received three teaching awards: the EECS Spira Teaching Award, the School of Engineering's Bose Junior Faculty Teaching Award and the Edgerton Faculty Achievement Award. He holds the SB (1987), SM (1989), EE (1990) and PhD (1993) all from MIT. He joined the faculty in 1993.



Leeb

Dr. Lakshminarayanan Mahadevan, the Karl van Tassel Associate Professor of Mechanical Engineering, has been promoted to associate professor with tenure. Professor Mahadevan received the BTech from the Indian Institute of Technology (1986), MS degrees from the University of Texas at Austin (1987) and Stanford (1992), and the PhD from Stanford (1995). His research spans many areas in classical physics, including elasticity (crumpling, twisting and folding of filaments and membranes), fluid mechanics (buckling of fluid interfacial dynamics), nonlinear physics (dynamics of interacting pulses in excitable media, chaotic nucleation phenomena) and biophysics (geometry of and stress in DNA, molecular mechanisms of motility). He joined the MIT faculty in 1996 and was named to the van Tassel chair in 1998. At MIT, Dr. Mahadevan co-created a new undergraduate biophysics elective and is co-writing a textbook on the subject. In April 2000 he received the Harold E. Edgerton Faculty Achievement Award.



Mahadevan

Dr. Earl Miller of the Department of Brain and Cognitive Sciences has been promoted to associate professor with tenure, effective July 1, 1999. Professor Miller has combined the theory and methodology of cognitive science with techniques used in neurobiology to advance cognitive neuroscience. Among his major discoveries are the significant role of the prefrontal cortex in integrating diverse information, controlling the allocation of attention, recalling long-term memories, and in learning "the rules of the game" needed to guide complex behavior. Professor Miller received a BA in psychology from Kent State University in 1985 and an MA (1987) and PhD (1990) in psychology and neuroscience from Princeton University. He joined MIT's Center for Learning and Memory and Department of Brain and Cognitive Sciences in 1995. He is the recipient of several awards for his scientific work, including the Pew Scholar Award (1996), the McKnight Scholar Award (1996), the John Merck Scholar Award (1998), the National Academy of Sciences Troland Research Award (2000) and the Society for Neuroscience Young Investigator Award (2000).



Miller

(continued on page 7)

23 awarded tenure by Corporation

(continued from page 6)

Dr. Heidi M. Nepf of the Department of Civil and Environmental Engineering has been promoted to associate professor with tenure. An environmental fluid dynamicist, she studies physical processes affecting the fate and transport of nutrients and contaminants in coastal and inland aquatic systems. Professor Nepf uses experiments, predictive theory and numerical tools to help analyze the behavior of water motion in wetlands, with the goal of improving the design of wetlands for water treatment and water quality assurance. She received an NSF Career Award for this work in 1996. She earned a BS from Bucknell University (1987), and MS (1988) and PhD (1992) from Stanford University. After a year as a postdoctoral scholar at Woods Hole Oceanographic Institute, she joined the MIT faculty in 1993. Three-time winner of the department's teaching award and recipient of the School of Engineering's Junior Bose Award for Excellence in Teaching, Professor Nepf also produced a series of cable and public television shows on environmental issues for high school students.



Nepf

Dr. Dava Newman of the Department of Aeronautics and Astronautics has been promoted to associate professor with tenure. Dr. Newman, a MacVicar Faculty Fellow, is known as a dynamic and vibrant leader, teacher and scholar. Her research goals are to develop comprehensive analytical models of the movement and performance of humans in low gravity and of adaptive human motor control. Such models will affect the understanding of astronaut performance and of human motor control disorders. She is an educational innovator and author of an undergraduate textbook with accompanying CD-ROM. Dr. Newman received the BS (1986) from the University of Notre Dame, the SM (1989) in aeronautics and astronautics, the SM (1989) in technology and policy, and the PhD (1992) in aerospace biomedical engineering, all from MIT. She was on the founding executive committee and helped to establish an international interdisciplinary program for graduate education at the International Space University.



Newman

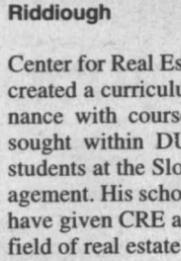
Ms. Ann Pendleton-Jullian of the Department of Architecture has been promoted to associate professor with tenure. Professor Pendleton-Jullian received the BArch (1979) from Cornell University and the MArch (1983) from Princeton University. She was assistant professor of architecture at Cornell University from 1986-1993 and came to MIT as assistant professor of architecture in 1993. She was promoted to associate professor in 1996. Professor Pendleton-Jullian, who maintains an individual practice, has been recognized internationally for her design work and at MIT for her excellence in teaching. She is a sought-after studio teacher and thesis advisor here.



Pendleton-Jullian

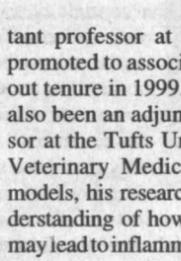
Dr. Timothy J. Riddiough, currently in his sixth year as the Edward J. and Joyce Linde Career Development Professor within the Department of Urban Studies and Planning (DUSP), has been promoted to associ-

ate professor with tenure. Professor Riddiough received the BBA (1981) in quantitative analysis, the MS (1984) in finance and the PhD (1991) in Real Estate from the University of Wisconsin at Madison. Professor Riddiough has been central to the successful development of MIT's Center for Real Estate (CRE) and has created a curriculum in real estate finance with courses that are widely sought within DUSP and by MBA students at the Sloan School of Management. His scholarship is known to have given CRE a leading role in the field of real estate finance.



Riddiough

Dr. David Ben Schauer of the Division of Bioengineering and Environmental Health and the Division of Comparative Medicine has been promoted to associate professor with tenure. Dr. Schauer received the BS from the University of North Carolina in 1983, the DVM from the University of North Carolina at Chapel Hill in 1987 and the PhD from Stanford in 1993. He was named an assistant professor at MIT in 1993 and promoted to associate professor without tenure in 1999. Since 1997 he has also been an adjunct assistant professor at the Tufts University School of Veterinary Medicine. Using animal models, his research has furthered understanding of how bacterial infection may lead to inflammatory bowel disease and increased risk of colon cancer. He is also working with Parsons Laboratory researchers on detecting pathogenic organisms in water supplies, and with an interdisciplinary engineering group to develop tissue-based biosensors to detect chemical and biological toxins.



Schauer

Mr. Andrew M. Scott of the Department of Architecture has been promoted to associate professor with tenure. Professor Scott's primary teaching focus is on design studio education within the graduate program in architecture. His own design work focuses on developing appropriate environmental technologies for buildings, natural ventilation techniques and generally making architecture environmentally responsible and accountable. Professor Scott received the BA (1974) and the BArch (1976) from the University of Manchester, UK. He has taught at the University of Manchester; Dalhousie University in Halifax, Nova Scotia; and at the University of Greenwich, UK. Professor Scott came to MIT in 1993 as an associate professor.



Scott

Dr. Madhu Sudan of the Department of Electrical Engineering and Computer Science has been promoted to associate professor with tenure. Professor Sudan joined the MIT faculty in 1997 as an associate professor. Before that he worked at IBM's TJ Watson Research Center from 1992-97. He earned the BTEch from the Indian Institute of Technology in New Delhi in 1987 and the PhD from the University of California at Berkeley in 1992. The research behind his doctoral thesis helped spawn a new era of



Sudan

research in theoretical computer science—the systematic study of the complexity of finding approximate solutions to optimization problems. He has been called the leading complexity theorist of his generation, and also is known for his work on the design of algorithms. His recent research is in coding theory.

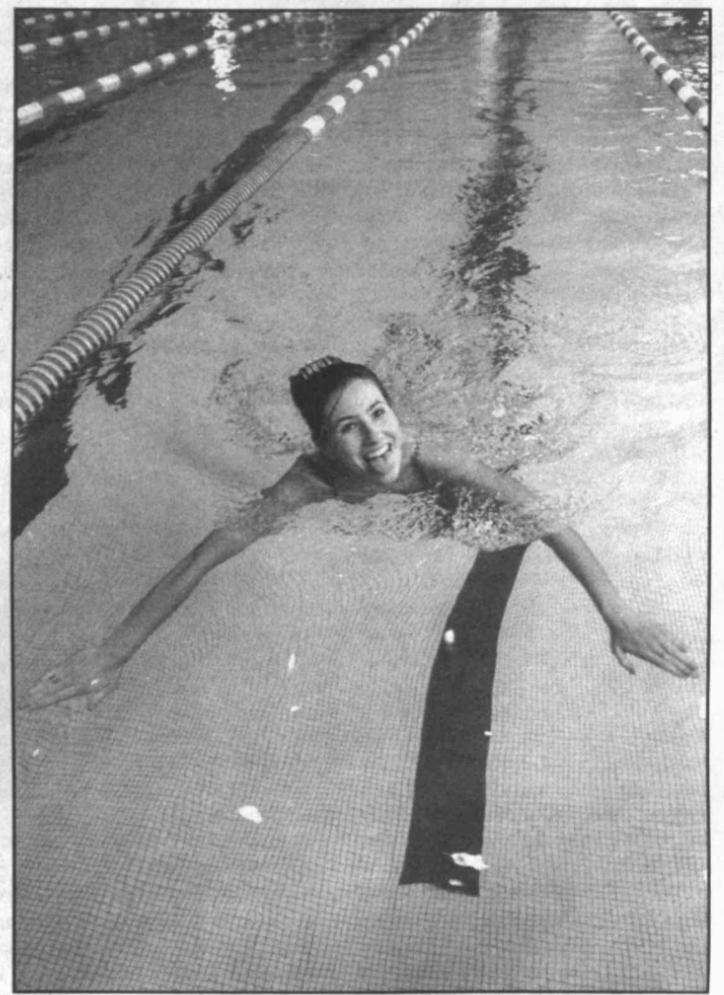
Dr. David L. Trumper of the Department of Mechanical Engineering has been promoted to associate professor with tenure. He came to MIT in 1993 as an assistant professor, was named to the Rockwell International Professorship in 1995, and was promoted to associate professor without tenure in 1996. Professor Trumper is a leader in the field of precision engineering, designing systems that require high resolution and extreme accuracy. His designs include the world's highest resolution magnetically suspended positioning stages for use in semiconductor fabrication and scanned probe microscopy, and a precision diamond turning machine for fabricating asymmetric optical parts. Holder of eight patents with three others pending, he received the American Society of Mechanical Engineering's Leonardo da Vinci Award in 1999. He holds three degrees from MIT: the SB (1980), SM (1984) and PhD (1990).



Trumper

and color aquatint by artists Shellburne Thurber, Sarah Sze, Adam Ross, Andrew Spence, Richard Tuttle, Lee Boroson, Sheila Pepe and Seong Chun.

Meter meritocracy



Incoming freshman Karolina Netolicka of the Czech Republic pants happily after successfully completing her swim test before classes began. All MIT students must pass the test in order to earn the bachelor's degree. Photo by Donna Coveney

List artwork on view soon to be on loan

While everyone can admire the works in the List Visual Arts Center's Annual Student Loan Art Exhibition, MIT students have the added thrill of entering a lottery to temporarily "own" the works for the school year. The collection includes signed original posters, prints and photographs by 20th-century artists such as Berenice Abbott, Alexander Calder, Jasper Johns, Robert Motherwell and Andy Warhol.

Each year new pieces are added to the collection. New works this year include lithograph, enamel and graphite on paper, text on crocheted paper, color photography, cyanotype

and color aquatint by artists Shellburne Thurber, Sarah Sze, Adam Ross, Andrew Spence, Richard Tuttle, Lee Boroson, Sheila Pepe and Seong Chun.

John Rexine, the List Center's new fine arts registrar, calls the Student Loan Collection "special and quite unique." Comparing it to a similar program he'd administered at the Rose Art Museum at Brandeis University, he noted, "Here the quality of the Loan Art collection is much higher, as is the student participation. And the annual addition of about 10 new works guarantees that the collection remains fresh, interesting and relevant."

Full time registered MIT students can enter the lottery at the List Center by filling in a registration card with the names of their three favorite works of art from the collection. Only one card per student or group is accepted for consideration. The lottery will be held on Monday, Sept. 18 and the winners' names will be posted at 6pm on the doors of the gallery. Art can then be picked up for the next three days, and on Friday, Sept. 22, a free-for-all will be held so that students not selected by lottery may choose from unclaimed work. Exhibition hours are 12-6pm daily.

Students (and others) can get a sneak peek at the newest art that will be available for loan in upcoming years on the third floor of the Student Center. For more information about the program, call x3-4680.

Arts at MIT

Institute Arts

For more arts-related information call the 24-hour hotline at 253-ARTS or consult the World Wide Web at <http://web.mit.edu/arts>.

* Open to public
** Open to MIT community only

September 13-24

MUSIC

Natyakalalayam Dance Company (Bharatanatyam Dance)*—Sept 17. \$15; \$12—students & seniors, MITHAS and New England Hindu Temple members; free—MIT students. 3pm, Kresge Aud. x8-7971 or <http://web.mit.edu/mta/mithas/>.

THEATER

"Elegance and Accident"*—Sept 21. Video lecture and lively conversation on creating street performance with Bill Shannon, a.k.a. The Crutchmaster. 12-1:30pm, Kresge Aud. x3-8089.

EXHIBITS

List Visual Arts Ctr.* (E15): Annual Student Loan Art Exhibition. See story this page. Through Sept 17. Lottery—Sept 19; pick-up—Sept 20-21; free-for-all—Sept 22. Daily 12-6pm, List Visual Arts Ctr., Building E15. x3-4680 or <http://web.mit.edu/lvac>.

MIT Museum* (N52): Holography: The Light Fantastic. A selection of holograms from the Museum's collection—the world's largest collection—illustrates the artistic and scientific facets of the medium. Thinkapalooza. Interactive zone for high-tech adventurers of all ages. "Family Adventures in Science and Technology" or "F.A.S.T. Sunday"*—Sept 24. Families will create a geodesic dome, build arches, test the strength of bridges they build, and discover the special challenges of building big in the Building Big Build-a-thon. Co-sponsored by WGBH, this program is a companion to the PBS miniseries, "Building Big with David Macaulay." Free with the price of Museum admission. 2-4pm, MIT Museum. 452-2827 or <fastsci@mit.edu>. Admission: \$5; \$2 students/seniors; \$1 children 5-18; free with MIT ID. 265 Mass Ave. Tues-Fri 10-5, Weekends 12-5. x3-4444.

Compton Gallery*—A 50-Year Reflection: Humanities, Arts, and Social Sciences at MIT. Celebrating the 50th anniversary of the School of Humanities and Social Sciences (now called the School of Humanities, Arts, and Social Sciences). Sept 21-Jan 26. Compton Gallery (Rm 10-150). Weekdays 9-5 (Special hours: Sat. Oct. 7, 10am-5pm; Sun. Oct. 8, 11am-4pm). x3-4444. <http://web.mit.edu/museum/exhibits/compton.html> or <http://web.mit.edu/shss/www/>.

The Dean's Gallery—Mary A. Harman: Breaking the Mold. Images using multiple print processes to explore issues of women's indi-

viduality and sanity. Opening Reception—Sept 14, 5-7pm. Sept 14-Nov 2. The Dean's Gallery, Sloan School of Management, E52-466. Weekdays 9-5pm. x3-9455 or <http://web.mit.edu/deans-gallery/www/>.

Wiesner Student Art Gallery: Here and Away. Exhibition of photographs and artwork created by staff members of Technique. Sept. 17-Oct. 7. Wiesner Student Gallery (Stratton Student Ctr 2nd floor). x3-2980.

Institute Archives and Special Collections Object of the Month—Sept: 1919 postcard of Hunsaker's "flying boat," the first aircraft to fly across the Atlantic. Hallway exhibit case across from Rm 14N-118. x3-5136.

OTHER

Potluck Performance Art Party*—Sept 15. Bring anything to read, show, perform and/or consume to get in free. \$4 donation requested for charity. 9pm, Rm N52-115. x3-2060 or <http://www.mit.edu/activities/miters>.

Arts Colloquium*—Sept 18. All MIT faculty and arts staff are invited to hear Prof. Stephen Tapscott, literature, speak on his work at noon. Lunch served; reservations required. Contact x3-9821 or <laura@mit.edu> by Sept 14.

Applications for Wiesner Student Art Gallery.** —All students welcome to apply to put up an exhibit. x3-7019.

Task force on minority achievement appointed

Eleven MIT professors and Rensselaer Polytechnic Institute President Shirley Jackson (SB 1968, PhD 1973) have been appointed to the Task Force on Minority Student Achievement, among them two faculty officers and two MacVicar Faculty Teaching Fellows. The appointments were made by President Charles M. Vest and Professor Steven R. Lerman, chair of the faculty.

The task force is charged with assessing and reviewing whether gaps exist between predicted and actual academic performance of MIT minority students and, if so, identifying the reasons for the gaps and recommending strategies to address the issue. The members will consult with experts inside and outside MIT as necessary.

The impetus to appoint the task force was provided in part by former Ivy League presidents Derek Bok of Harvard and William Bowen of Princeton in their book *The Shape of the River*. The authors identify a gap between academic expectation and accomplishment among African-American students at 28 selective US universities. MIT was not included in their study.

President Vest has discussed the issue for the past year with members of the MIT community and concluded that an internal study was called for. "We must examine this question in a substantive manner here as well," President Vest said at last February's Dr. Martin Luther King Jr. Celebratory Breakfast. At that time he said he would appoint the task force.

President Vest said, "We in leading colleges and universities have two fundamental duties regarding all students: first, to seek and admit talented, accomplished and motivated students; and second to provide a learning environment that enables them to realize their highest academic and personal potential. The contributions of our minority graduates to virtually every field are striking. And yet, their reflections on their MIT experiences also raise a persistent question: Given the talent and promise of our students and the resources that we devote to developing that talent, have we done—are we doing—our best?"

Professor Lerman said, "It is crucial that as faculty, we provide all of our students with an educational experience that helps them fulfill their full potential. The task force will help us better understand how both the formal curriculum and the overall academic environment affect how students learn."

The task force will be chaired by Professor John M. Essigmann of bioengineering and environmental health and chemistry, who is housemaster of New House.

Professor Essigmann said, "The ultimate phase of our task will be to propose programmatic strategies to make the MIT environment as good as possible for minority students. Certainly, part of this task will be to look at what other science and engineering institutions do, but we want to try to be as inventive as possible in coming up with solutions that will work in our environment."

Other members of the task force are professors Michael Artin of mathematics; Arnold Barnett of the Sloan School of Management; Rafael Bras of civil and environmental engineering; Evelyn Hammonds of science, technology and society; Paul Matsudaira of biology; Daniel Nocera of chemistry; Adam Clayton Powell IV of materials science and engineering; Rafael Reif of electrical engineering and computer science; Leigh H. Royden of earth, atmospheric and planetary sciences; James Williams Jr. of mechanical engineering; and Dr. Jackson, a lifetime trustee of the Institute. Karl Reid, executive director of special programs in the School of Engineering, will provide the principal staff support for the task force.

Professor Matsudaira is associate chair of the faculty and Professor Hammonds is secretary of the faculty.

Professors Essigmann and Williams are MacVicar Faculty Teaching Fellows, selected for their outstanding contributions in teaching and innovation in education.

The task force held its first meeting last Friday. President Vest and Professor Lerman have requested a report by the end of the academic year. "We have a big task, and we'll try to meet our deadline," said Professor Essigmann. "At the end of the semester we should know whether our job will have to continue into next year."

Taking appropriate measures to maintain the confidentiality of student records, the group will statistically assess the academic performance of MIT's minority and non-minority undergraduates and their correlation with high school records of accomplishment, grades and test scores.

They will examine strategies adopted by other universities to support academic achievement, identifying successful practices while taking cognizance of factors that may be especially pertinent to programs in science and engineering.

They also will assess how advising, mentoring and participation in key undergraduate programs such as the Undergraduate Research Opportunities Program (UROP) differ for minority and non-minority students, and how those differences might contribute to possible differences in academic performance.

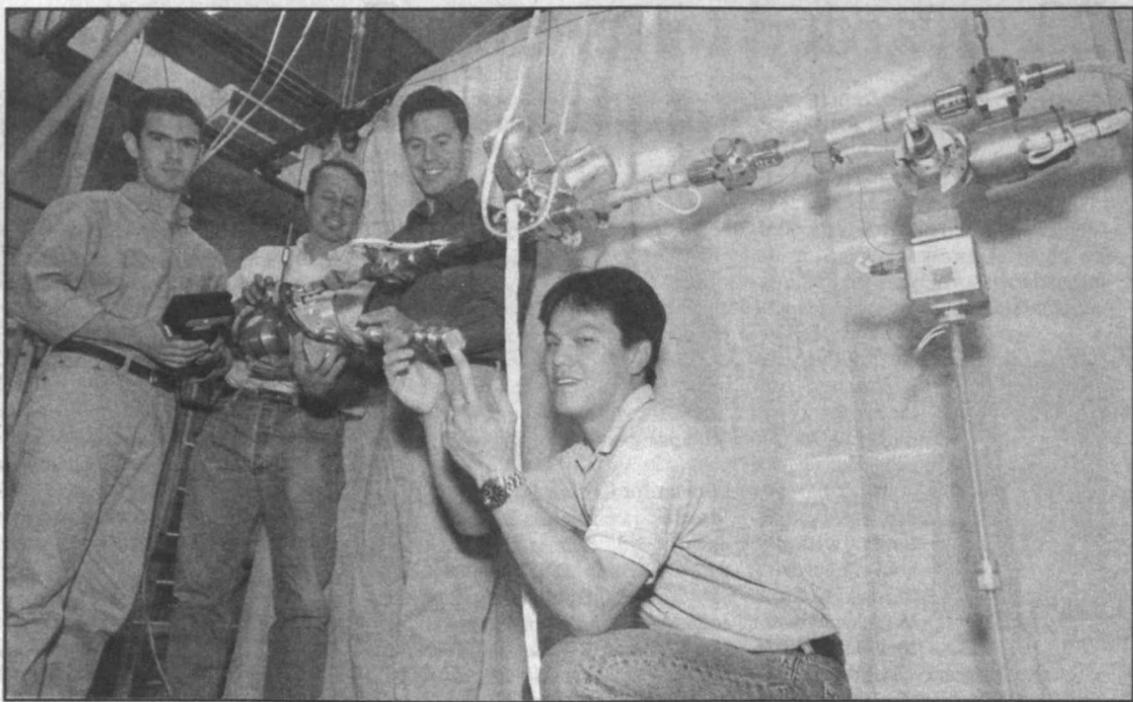
The group will evaluate the services, resources and organizational structure available to support the academic achievement of minority students at MIT.

"The early work of the task force will be to find out what data are available to assess issues relevant to our charge," said Professor Essigmann. The members will start by interviewing students and administrators. Once the interviews have been completed, the task force will collect and analyze data. The group will deliver a written report to President Vest and Professor Lerman.

The task force plans to consult with, among others, Dean of Admissions Marilee Jones; Associate Dean Leo Osgood Jr., director of the Office of Minority Education (OME); Associate Dean Margaret Enders, co-director of Academic Services; Regina Caines, director of Affirmative Action and Diversity Programs; Dean for Undergraduate Research Kim Vandiver, faculty director of UROP; Dean for Graduate Students Isaac Colbert; and others who play a role in bringing minority students to MIT and who maintain a sustained relationship with them.

The text of Dr. Vest's 2000 Dr. Martin Luther King Jr. Celebration speech is available at <http://web.mit.edu/president/communications/MLK00.html>.

Robert J. Sales



MIT researchers in the Department of Aeronautics and Astronautics stand with the instrumented truss that is key to the first hands-on experiment aboard the International Space Station. Left to right: sophomore Cemocan Yesil, Associate Professor David Miller, postdoctoral fellow Gregory Mallory and graduate student Jeremy Yung.

Photo by Donna Coveney

MIT experiment in space is first of its kind

(continued from page 1)

"Unlike many other space experiments, ours is really a highly interactive laboratory," said Associate Professor David W. Miller of the Department of Aeronautics and Astronautics, co-principal investigator for the work with AFRL's Rory Ninneman. Researchers on Earth will be in regular contact with the astronauts running the hardware, who will send back data and receive software for new tests.

"The MACE II experiment will be the first active US payload on the International Space Station," said Dr. John Uri, ISS lead increment scientist at NASA's Johnson Space Center. Other experiments also will be aboard the ISS, but the MIT work is the first hands-on experiment. The others are passive.

"As a collaborative effort between the AFRL and MIT, MACE II brings together leading organizations in industry, academia and government," Dr. Uri said. "Being able to fly this experiment at this early stage of the assembly of the ISS demonstrates the flexibility of the program in accommodating the needs of the research community."

"MIT is proud of having this experiment chosen by NASA as the first active scientific investigation aboard the ISS. We look forward to continued participation in NASA's ambitious program of scientific experimentation aboard the ISS," said Professor Edward Crawley, head of MIT's Department of Aeronautics and Astronautics (aero/astro).

VIBRATIONS IN SPACE

The Middeck Active Control Ex-

periment II (MACE II) is key to learning more about how things move and vibrate in space, and how to sense and control those vibrations. The six-foot-long instrumented truss that the astronauts will work with "allows us to test our techniques for predicting motion and controlling it," Professor Miller said.

Structures in space, such as telescopes and robotic arms, are sensitive to vibrations and can be ruined because of them. Yet this can't be tested on Earth because the same structures behave differently on Earth and in space due to the Earth's gravitational field. "The MACE II laboratory allows us to test the effects of vibrations in zero gravity," said Professor Miller, who is also director of MIT's Space Systems Laboratory.

MACE I flew for two weeks in 1995 aboard the space shuttle. It was preceded by two other shuttle experiments led by Professor Crawley. MACE II—the experiment headed for the ISS—will stay in space for about four months. "With multiple months as opposed to weeks for conducting tests, we'll really be able to do a lot," Professor Miller said.

"The effectiveness of a research lab depends upon how closely the researcher is able to interact with the experiment as well as how easily the experiment can be modified," Professor Miller said. This process is difficult to do when the researcher is on the ground and the experiment is in space. However, MACE was designed with reconfigurable hardware and reprogrammable software. Long-duration testing on the ISS finally allows us to demonstrate how MACE

allows the researcher to have a virtual presence with a remotely located experiment."

MIT LINKS

MIT is linked to the historic opening of the ISS in yet another way. The first crew to live aboard the ISS will be commanded by MIT alumnus William M. Shepherd (SM, OE 1978). Mr. Shepherd will have primary responsibility for operating MACE II.

Mr. Shepherd's crew is scheduled to be launched on October 30 aboard a Russian Soyuz launch vehicle from the Baikonur Cosmodrome in Kazakhstan. After nearly four months in space, the crew is scheduled to return to Earth aboard the space shuttle Discovery in February 2001.

The Air Force Research Laboratory and MIT jointly manage the MACE II program. In addition to Professor Miller, MIT staff involved include Air Force Col. (ret.) Peter W. Young, a senior lecturer in aero/astro. Col. Young played a key role in advocating the reflight of the MACE hardware. "Helping get the MIT MACE project back into space and onto the ISS was an extremely satisfying and rewarding experience," Col. Young said.

Several MIT students also are involved in the program, including aero/astro graduate students Sean Kenny and Jeremy Yung, and sophomore Cemocan Yesil.

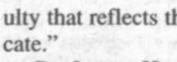
The MIT team includes Lockheed Martin Corporation, Mide Technology Corporation of Cambridge, NASA Langley Research Center and NASA Goddard Spaceflight Center. In addition, Payload Systems, Inc. of Cambridge worked closely with MIT to design, build, integrate and operate the original MACE hardware.

The work was funded by the US Air Force Research Laboratory.

Council headed by Brown, Clay, Hopkins

(continued from page 1)

student body, the MIT Council on Faculty Diversity will work with the faculty, departments, schools and the senior administration to help the Institute aggressively promote faculty diversity. These efforts will work to establish a sustained institutional environment that will attract a diverse faculty that reflects the students we educate."



Clay

Professor Hopkins commented, "Achieving a faculty whose diversity reflects that of the students we train has proven to be more complex than first imagined. Because of the deep commitment of this administration and of so many faculty here, I think there is no better place now than MIT to

solve this important problem."

Professor Clay said, "I look forward to working with faculty colleagues to attract women and minority faculty. Diversifying the faculty is a critical part of our leadership role and our commitment to student development."

The Council is to consider all aspects of faculty development:

- Tracking the number of women and minority students through undergraduate and graduate schools, to post-doctoral associate positions and finally to faculty positions.
- Designing programs and policies to increase their number and to promote retention.
- Examining policies and processes for faculty hiring within MIT, and making recommendations on how to improve faculty searches and recruitment of women and minority candidates.
- Creating programs and policies that are sensitive to the need to balance an academic career with a family life.

- Establishing an open and inclusive environment for a diverse faculty that promotes involvement in leadership throughout MIT.

The other members of the council are professors Lotte Bailyn of the Sloan School of Management; Rafael Bras, head of civil and environmental engineering;



Brown

Lorna Gibson of materials science and engineering; Evelyn Hammonds of science, technology and society; Wesley Harris of aeronautics and astronautics; Jacqueline Hewitt of physics; Thomas Magnanti, Dean of Engineering; Kenneth Manning of the Writing Program and science, technology and society; and Robert Silbey of Chemistry, the Dean of Science.

Aero/astro department to 'launch' new building today

A ribbon-cutting ceremony marking the opening of the Learning Laboratory for Complex Systems and introduction of a new educational curriculum for the Department of Aeronautics and Astronautics will be held today, Wednesday, Sept. 13 in Building 33 from 5:30-7:30pm.

Members of the MIT community are invited to attend the event, which also will include self-guided tours of departmental labs associated with the new building. For more information, contact Kathi Grace at x3-3251 or kathi@mit.edu.