

# Harvard-MIT Division of Health Sciences and Technology

## Introduction

In September 2005, the Harvard-MIT Division of Health Sciences and Technology (HST) celebrated its 35th anniversary. Over 350 alumni, faculty, students, and friends of HST attended a weekend of festivities, including a daylong symposium, an exhibition of current HST academic programs and research centers, and an evening gala. Leaders from both the Harvard and MIT communities spoke during the weekend, as did 16 alumni, who presented talks on the many different technologies and specialties HST touches, such as neuroscience, cardiology, cancer, tissue engineering, stem cells, and genetics.

The anniversary celebration provided an opportunity for everyone close to HST to reflect on HST's growth, accomplishments, and potential. It also generated tremendous excitement about the future. The weekend helped solidify an HST alumni association and it infused energy into HST's recently formed Advisory Council. Now HST is translating this momentum into the work of defining and implementing the vision for HST over the next 35 years.

## The HST Community

### Overview

Currently, HST has 65 faculty and 211 affiliated faculty. Fourteen faculty members have primary appointments in HST, 51 have joint appointments in HST and another department at either Harvard or MIT. These numbers include faculty who have been newly recruited to Harvard/MIT, and also those who have primary appointments in other academic units but are newly appointed as joint or affiliated faculty in HST.

#### HST faculty, AY2006

Appointment type	By gender			Underrepresented minorities
	Men	Women	Total	
Primary/dual	12	2	14	3
Primary/dual, plus joint/second	59	6	65	10

In September 2005, there were 430 students enrolled in HST's graduate programs, of whom 85 were newly admitted. In addition, 12 students participated in our Summer Institute programs, and 280 undergraduate and 105 graduate students were members of the BioMatrix mentoring program. At HST's graduation ceremony in June, we celebrated 82 newly conferred degrees, bringing the number of HST alumni to more than 1,000.

**Enrollment in HST degree programs, AY2006**

<b>Degree program</b>	<b>Number of students</b>	<b>% Women</b>
Master's programs	57	8%
MD	105	25%
MD/PhD*	87	22%
PhD	189	32%
<b>Total</b>	<b>430</b>	

\* Includes eight students simultaneously enrolled in MD and MEMP.

**HST Advisory Council.** Realizing that the “bench to bedside” paradigm requires successful commercialization of new products and tools, HST has instituted a number of initiatives to bring members of the private sector closer to HST. Beginning in 1998, HST formed an Advisory Council, which today includes 45 leaders in the medical device, biotech, venture, legal, and academic sectors.

**HST alumni organization.** HST alumni banded together this year to form the HST Alumni Council, dedicated to increasing and strengthening the ties among alumni, as well as between them and the HST community. The council was formally created on March 23, and it plans to provide resources to HST alumni for career development; to encourage regional activities for HST alumni; to build and populate an alumni web portal; to create at least one HST alumni event each year; to promote career opportunities for current HST students through internships and employment; to facilitate alumni-student interaction; to help develop a fundraising program targeted at alumni; and to foster HST brand recognition. HST director Martha L. Gray welcomed the council as “a critically important component of HST’s bold new vision.”

**HST Forum.** The 19th annual HST Forum featured keynote speaker David Ho, MD ‘78, who spoke on “HIV Lymphocyte Dynamics and Implications for Therapy.” Ho is the founding scientific director and CEO of the Aaron Diamond AIDS Research Center, and the Irene Diamond Professor at Rockefeller University in New York. His talk can be viewed at <http://mitworld.mit.edu/>. Ho emphasized the significance of HIV-1 infection and reviewed the life cycle of the virus, the pathophysiology of the infection, the action mechanisms of the therapeutic agents currently available, and future strategies for treatment. The student poster session, generously underwritten by gifts from Les Laboratoires Servier, Amgen, and Guidant, featured 79 student research posters that reflected a wide spectrum of research and represented all HST programs.

**HST Graduation.** Leon E. Rosenberg, MD, professor in the Department of Molecular Biology and the Woodrow Wilson School of Public and International Affairs at Princeton University, delivered the keynote address at HST’s commencement on June 7, 2006. Eighty-two degrees were awarded to 79 graduates. Twenty-one students graduated with PhD degrees, one received an ScD degree, 34 graduated with MD degrees, one received a DDM degree, and 25 received master’s degrees. Ten MD students graduated with honors, four *cum laude*, five *magna cum laude*, and one *summa cum laude*.

**Celebration of Biotechnology event.** In August, HST and the MIT Entrepreneurship Center hosted the fourth annual Celebration of Biotechnology in Kendall Square. This important event recognizes and brings together biotechnology companies (74 and growing) in the Kendall Square area in order to foster closer ties between these companies and the MIT community. The newly launched MIT Center for Biomedical Innovation hosted a forum on safe medicines entitled “New Medicines: Can Innovation and Safety Coexist?” The participants, including several HST faculty, enjoyed a party outside Building E25, with brief remarks and toasts made by Joseph V. Bonventre; Kenneth P. Morse, managing director of the MIT Entrepreneurship Center; Deborah Dunshire, MD, CEO of Millennium Pharmaceuticals; and Thomas Finneran, president of the Massachusetts Biotechnology Council.

**Decision Systems Group anniversary celebration.** The HST-affiliated Decision Systems Group celebrated its 25th anniversary in September with a symposium entitled “Past, Present and Future of Some Grand Challenges in Biomedical Informatics.” This symposium examined a field that has grown into an area with enormous potential to improve the quality and safety of medical care.

**Second annual HST Faculty Research Retreat.** Forty-five members of HST’s faculty—including primary, joint, and affiliated faculty—along with 10 staff members, met on June 26 at the Wellesley College Club for HST’s second annual daylong retreat devoted to research presentations. The emphasis this year was on familiarizing the community with the research located at HST’s research “nuclei,” or centers, located at various institutions in the area. Presentations were made by members of the Children’s Hospital HST Informatics Program (CHIP), the Wellman Center for Photomedicine at Massachusetts General Hospital (MGH), HST’s Martinos Center for Biomedical Imaging at MGH in Charlestown, the Center for Biomedical Innovation at MIT, and by several members of HST’s faculty located at Harvard Medical School (HMS) in the Longwood Medical Area and at MIT. The talks were held to five minutes each, with a short discussion following each presentation. This format contributed to a captivating, fast-moving program that introduced the participants to a wide range of research projects, with the potential for new interactions and collaborations.

**Second annual HST Faculty Poster Session.** Sixty faculty members affiliated with HST presented posters at the second annual HST Faculty Poster Session, an event that is now a repeat success and an integral part of the fall academic schedule. The session allows faculty members to showcase their research and attract HST students to their labs, while at the same time introducing new HST students to the rich and varied research opportunities available to them.

## Research Programs

Research programs enhance HST’s educational focus and facilitate progress in areas where the combined efforts of Harvard and MIT will yield outcomes superior to the efforts of the individual institutions. HST’s research programs are based on several core principles:

1. Research is a critical component of student training. Here, the HST organization is responsible for reviewing student research proposals, administering thesis committees, reviewing theses, and advising students on the choice of thesis labs. HST actively integrates research topics into HST subjects.
2. HST faculty researchers are role models for our students. To educate and train its students, HST requires a committed faculty community that devotes time and energy to implementing HST's mission. HST organizes this community by recruiting like-minded faculty, by making them stakeholders in the organization, and by identifying them as members of the HST faculty.
3. HST facilitates multidisciplinary, inter-institutional research that benefits student training. HST partners with groups of faculty "nuclei", for example, the Wellman Laboratories of Photomedicine at MGH, CHIP at Children's Hospital Boston (CHB), the Genetics Division at Brigham and Women's Hospital (BWH), and others to encourage multidisciplinary, inter-institutional research. This partnering has many benefits. First, it helps provide a stable, committed faculty for HST educational programs. Second, individual faculty at the aforementioned nuclei actively seek an HST affiliation because HST provides significant career mentoring and gives them (especially doctoral students working in clinical departments) an academic "home" where they are stakeholders. Third, the HST research nuclei model is an important source of funding for HST students. Fourth, the HST research nuclei model is a tangible example of inter-institutional, interdisciplinary research that can be used to target potential donors in HST fundraising efforts.
4. By facilitating multidisciplinary, inter-institutional research, HST is a key broker for new faculty recruitments, reaching out to individuals who fit the HST profile and are drawn to it over traditional departments at Harvard or MIT. There are a number of examples of these individuals, including John Gabrieli (MIT), Emery Brown (MIT), David Cohen (BWH), Randy Buckner (HU), Shiladitya Sengupta (BWH), Martha Bulyk (Genetics, BWH), and Shamil Sunyaev (Genetics, BWH).
5. HST promotes research in several areas where the Harvard-MIT collaboration will have greater benefits and stronger outcomes than could be achieved by the individual institutions acting alone. These areas are biomedical imaging, biomedical informatics and integrative biology, and functional and regenerative biomedical technologies.

**Space: Consolidation into E25.** HST anticipates a significant improvement in faculty community associated with the planned renovation of Building E25 and the consolidation of HST faculty into the renovated space. This is a very important development for HST that will enhance interactions and collaborations among our faculty. Today, HST's research footprint includes about 25,000 square feet of MIT space.

**Organizing/Unifying Activities at Other Sites.** An ongoing goal is to enhance HST's visibility and impact by organizing and facilitating MIT-Harvard interactions and collaborations. The current focus is on interactions with the Harvard teaching hospitals. These interactions are mutually beneficial because the Harvard teaching hospitals offer

world-class clinical collaborators and clinical perspectives to MIT researchers, while MIT offers the powerful foundation of science and engineering to Harvard teaching hospital faculty. Uniting the two institutions in this way seeks to produce educational and research outcomes that are superior to those that could be achieved by either institution alone.

Because of its inter-institutional position, HST is uniquely situated to facilitate faculty recruitment. HST has played a key role in recruiting new MIT faculty, including John Gabrieli and Emery Brown, as well as Harvard Faculty, including David Cohen, Randy Buckner, Shiladitya Sengupta, and Ali Khademhosseini. MGH, CHB, Beth Israel Deaconess Medical Center (BIDMC), and BWH have all approached HST with requests to participate in the recruitment of new faculty; moreover, hospital faculty continue to express strong interest in affiliating with HST and participating in HST educational programs. Successful collaborations with CHB and BWH have resulted in the assignment of HST laboratory space in these institutions.

The recent addition of hospital-based research space has promoted a new model for multi-institutional research programs. After careful planning that included consultations with faculty and the MIT administration, three focus areas were identified for HST research:

- Biomedical imaging
- Biomedical informatics and integrative biology
- Functional and regenerative biomedical technologies

### **Educational Programs**

HST's educational programs are dedicated to training the next generation of leaders in medicine and science who are committed to bringing new advances to understand, prevent, treat and cure disease. Today, HST is among the largest biomedical engineering and physician scientist training programs in the United States, with 430 students enrolled in its academic programs during AY2006.

In all of HST's educational programs, students are taught to have a deep understanding of engineering and the physical and biological sciences. Theoretical work is complemented with hands-on experience in the clinic or in industry. HST graduate students work with eminent faculty and affiliated faculty members from the Harvard and MIT communities. Admission is very competitive for all of the programs, with acceptance rates around 10%. Whether pursuing careers in medicine, research, industry, or government, HST graduates have made outstanding contributions to advances in health care.

### **Summer Scholars Program**

Since 2003, HST has offered a variety of summer programs that aim to expose talented undergraduates, and particularly underrepresented minorities, to research in general and to HST in particular. Twelve students per year participate in HST's



Biomedical Optics Summer Program, which is funded by an NIH/NSF Bioengineering and Bioinformatics Summer Institute (BBSI) grant and offered in partnership with the Wellman Laboratories of Photomedicine at MGH. Another eight students (four of them underrepresented minorities) are currently participating in HST's Summer Program in Bioinformatics and Integrative Genomics, offered in conjunction with Integrating Informatics from Bench to Bedside (i2b2). These summer scholars participate in some aspects of MIT's Summer Research Program, which brings members of underrepresented minorities and individuals from economically disadvantaged backgrounds to MIT for a summer research experience.

Students in these summer programs attend lectures, hear talks from leaders in the field about their research, and participate in laboratory work under the supervision of a faculty mentor. Students participate in seminars designed to develop knowledge about how to conduct research responsibly and ethically. In addition, they receive guidance through both individual tutorials and workshops on how to prepare and present research findings. At the end of the summer, students make a formal presentation of their work to the faculty mentors.

Student responses indicate that combining a research experience with academic support is very successful. Students appreciate the opportunities provided to network with members of their laboratories, HST graduate students, and HST staff. The Summer Scholars Program is growing both in size and in diversity. We are actively seeking funding from a number of sources and expect to apply for renewal of the BBSI grant in 2006.

### **BioMatrix**

Now in its sixth year, BioMatrix, the HST-sponsored mentoring community for undergraduate and graduate students, had a student membership of 400, again attracting more than 50 new freshmen. The monthly dinner programs offered this year included presentations on interviewing skills; marketing a product idea; how health care financing affects health care delivery; mind-body medicine; opportunities for community service in medicine and the biosciences; and deciding between a PhD and an MD path. We are grateful for the generous individual support this year from Anthony Williams, of the HST Advisory Board, and institutional support from the offices of MIT's deans for student life, graduate students, and undergraduate education.

### **Subjects Added or Significantly Modified**

HST.186 Frontiers in (Bio)Medical Engineering and Physics, *S. Bhatia, M. Poe*

HST.188 Statistics for Neuroscience Research, *E. N. Brown*

HST.422J A Clinical Approach to the Human Brain, *T. N. Byrne*

HST.424J Diseases of the Nervous System, *T. N. Byrne*

HST.491 Reviewing Biomedical Literature, *D. S. Kohane*

HST.508 Quantitative Genomics, *L. Mirny et al.*

HST.509 Computational and Functional Genomics, *M. Bulyk et al.*

HST.527 Blood Vessels and Endothelial Phenotypes in Health and Disease, *W. Aird, G. Garcia-Cardena*

HST.557 Introduction to Molecular Simulation, *C. Stultz*

HST.580 Data Acquisition and Reconstruction in MRI, *E. Adalsteinsson*

HST.582J Biomedical Signal and Image Processing, *J. Greenberg, W. Wells, J. W. Fisher, L. D. Braid*

HST.727J The Lexicon and its Features, *D. Steriade et al.*

HST.780 Advanced Speech and Audio Processing, *P. J. Wolfe*

HST.854 Evaluating a Biomedical Business Concept, *R. J. Cohen*

HST.949J Computational Evolutionary Biology, *R. C. Berwick*

HST.986 The Legal Framework of Biomedical Enterprise, *J. Akula*

HST.987 Case Studies and Strategies in Drug Discovery and Development, *F. L. Douglas, S. R. Tannenbaum, A. J. Sinsky*

## Administration

HST's administrative home is located at the Whitaker College of Health Sciences and Technology at MIT. As one of the five medical societies at Harvard Medical School, HST also maintains an office at the medical school's quadrangle campus in Boston. HST's directors, Martha L. Gray, PhD (HST '86), for MIT and Joseph Bonventre, MD, PhD (HST '76), for HMS, report to the provost and to the vice president for research and associate provost at MIT, as well as to the HMS executive dean for academic programs and the dean of Harvard Medical School. Richard N. Mitchell, MD, PhD, and Lee Gehrke, PhD, serve as the division's associate directors.

## Staff Awards and Milestones

- Amy Donovan, administrative assistant to Professor Richard Cohen, won an MIT Excellence Award for her efforts to increase recycling awareness at the Institute.
- Pamela K. McGill, administrative assistant to HST director Martha Gray, won an Infinite Mile Award.
- Patricia Cunningham, academic program administrator, became a member of the MIT Quarter Century Club.
- Ron Smith, former MIT associate registrar and HST academic records administrator, retired June 30, 2006, after a long and successful career with MIT and HST.

## **Appointments, Promotions, Awards, and Honors**

### ***New Faculty Appointments***

Emery Brown, MD, PhD, was appointed to HST's primary faculty in October 2005, in a dual appointment with the Department of Brain and Cognitive Sciences. His title is professor of health sciences and technology and professor of computational neuroscience. Professor Brown's research focuses on mathematical modeling of physiologic systems in three areas: the development of signal processing algorithms to study how individual and ensembles of neurons encode information about relevant biological stimuli; statistical methods for analysis of functional neural imaging data; and statistical models to accurately characterize the salient physiologic properties of human circadian and neuroendocrine rhythms.

Alireza (Ali) Khademhosseini, PhD, instructor in medicine at HMS and BWH, is a new member of the HST joint faculty. Along with HST faculty member Shiladitya Sengupta, PhD, instructor of medicine and HST at HMS and BWH, he has launched a research program focusing on nano and microsystems bioengineering and cell biology. Both are based at the BWH research center on Landsdowne Street in Cambridge, near MIT.

Other new faculty members appointed to the joint faculty this year are: Ram Sasisekharan, professor of biological engineering and health sciences and technology at MIT; M. Christian Brown, associate professor of otology and laryngology at HMS, Massachusetts Eye and Ear Infirmary (MEEI); and John Guinan, associate professor of otology and laryngology at HMS, MEEI. Professor Sasisekharan is focusing on developing HST's relationship with the US Food and Drug Administration (FDA), and Professors Brown and Guinan are key faculty members in HST's Speech and Hearing Bioscience and Technology (SHBT) program.

### ***Faculty Promotions***

John J. Rosowski, PhD, was promoted to professor of otology and laryngology. A member of the HST joint faculty, he is codirector of the Wallace Middle Ear Research Unit, Eaton-Peabody Laboratory, MEEI.

Dennis M. Freeman, PhD, member of the HST faculty, was promoted to professor of electrical engineering at MIT. His research is focused on sound-induced motions of the sensory receptor cells in the inner ear.

Hugh Herr, PhD, was promoted to associate professor of media arts and sciences and health sciences and technology at MIT. Herr's research focuses on biomechanics and biological motion control and their application to rehabilitation technologies for the treatment of human physical disability.

Steve Massaquoi, MD, PhD, was promoted to associate professor of electrical engineering and computer science and health sciences and technology. Dr. Massaquoi's research focuses on interdisciplinary understanding of the nature of control executed by the human central nervous system in order to understand the dynamics of human thought and its dysfunctions.



### ***Faculty Awards and Honors***

Donald Ingber, MD, PhD, HST affiliated faculty and Judah Folkman professor of vascular biology in the Department of Pathology at CHB, is the recipient of a \$750,000 grant from the National Academies Keck Futures Initiative for his research in nanotechnology.

Martha Bulyk, PhD, assistant professor of health sciences and technology, and Shiladitya Sengupta were both named among the Top 100 Technology Innovators Under 35 by *Technology Review*. Bulyk was recognized for adapting gene chip technology to determine the DNA binding preferences of proteins. Sengupta was named for his invention of a nanoscale drug delivery device to treat cancer.

Robert S. Langer, Jr., ScD, professor of health sciences and technology and Institute Professor at MIT, is one of the principal investigators at the MIT-Harvard Center of Cancer Nanotechnology Excellence, which received a five-year, \$20 million grant from the National Cancer Institute. Langer was also inducted into the National Inventors Hall of Fame on May 6. He was selected for the Hall of Fame for having developed sustained-release drug delivery systems.

Helmut G. Rennke, MD, HST affiliated faculty and professor of pathology at HMS and BWH, received the 2006 Jacob Churg Award, awarded by the United States and Canadian Academy of Pathology. This is the highest honor that renal pathologists can receive from their peers.

HST professors Martha L. Gray and Elazer Edelman, MD '83, PhD '84 received one of 13 awards from the Howard Hughes Medical Institute to fund innovative graduate programs that will introduce bioscience graduate students to the world of clinical medicine.

Hugh M. Herr, director of the Biomechatronics Group at MIT, has won the first *Popular Mechanics* Breakthrough Award for his work with prosthetics.

Roger D. Kamm, PhD, HST affiliated faculty and professor of mechanical and biological engineering at MIT, has been appointed to the Germeshausen professorship for a five-year term.

John D. E. Gabrieli, PhD, recently named Grover Hermann professor of health sciences technology and brain and cognitive sciences, is one of the investigators in a project using an interdisciplinary, interdepartmental approach to understand the genetic, molecular, and behavioral aspects of autism that received a \$7.5 million grant from the New York-based Simons Foundation.

Peter Szolovits, PhD, professor of computer science and engineering and health sciences and technology, technology, and the MIT site director of the Biomedical Informatics Training Program in HST, was elected to membership in the Institute of Medicine in recognition of his research in applying artificial intelligence methods to medical decision making and health care information system design.

Sangeeta N. Bhatia, PhD '97, MD '99, associate professor of health sciences and technology, was awarded one of the five grants awarded by the Deshpande Center for Technological Innovation this year to research human liver models for faster and safer drug development. Bhatia was also named a member of the Biomaterial and Biointerfaces Study Section, Center for Scientific Review, National Institutes of Health.

HST faculty members Robert Langer, Lawrence Young, and Chi-Sang Poon have been inducted into the Biomedical Engineering Society's Inaugural Class of Fellows.

George M. Church, PhD, professor of genetics at HMS and HST affiliated faculty, was cited in the December 2005 issue of *Scientific American* for having been influential in science and technology in the past year. Church was recognized for inventing a new method for producing synthetic DNA.

Charles A. Czeisler, MD, PhD, the Frank Baldino, Jr., PhD professor of sleep medicine at HMS and BWH, HST affiliated faculty, was inducted as president of the Sleep Research Society.

Jeffrey Flier, the George Reisman professor of medicine at HMS and BIDMC, HST affiliated faculty, received the American Diabetes Association's 2005 Banting Medal, which recognizes significant contributions to the understanding, treatment, or prevention of a disease. Flier was also appointed to the Advisory Council of the National Institute of Diabetes and Digestive and Kidney Diseases.

Joseph B. Nadol, Jr., MD, the Walter Augustus Lecompte professor of otology and laryngology at HMS and MEEI, and head of the Department of Otology and Laryngology at MEEI, received the 2005 Distinguished Alumnus Award from the Johns Hopkins University Alumni Association. He was honored for his work in the fields of temporal bone histopathology and cochlear implants.

Valerie Pronio-Stelluto, MD, instructor in medicine at HMS and Mt. Auburn Hospital, HST affiliated faculty, received the 2005 Internist of the Year Award at the annual meeting of the Massachusetts Chapter of the American College of Physicians.

Elfar Adalsteinsson, PhD, assistant professor of health sciences and technology, was appointed to the Robert J. Shillman career development professorship in electrical engineering and computer science for a three-year term. His research area is medical imaging.

Anthony Sinskey, ScD, professor of health sciences and technology at HST and professor of biology at MIT, is now codirector of the new Center for Biomedical Innovation. Sinskey also received the 2006 Biomedical Enterprise Program Teaching Award. The graduating class honors one faculty member with this award for outstanding contributions to their education and to their program.

Kenneth D. Mandl, MD, HST affiliated faculty and assistant professor of pediatrics at HMS and CHB, received the Presidential Early Career Award for Scientists and

Engineers in 2005. Mandl is also co-principal investigator of a program to form a US Centers for Disease Control and Prevention (CDC) Center of Excellence in Public Health Information, funded by a \$4.5 million national grant. The grant, awarded to CHIP, in association with several other Massachusetts health care associations, aims to build a private, secure system that can be adopted by health systems throughout the country.

Frederick J. Shoen, MD, PhD, professor of health sciences and technology and of pathology at HMS and BWH, received the Distinguished Achievement Award from the Society for Cardiovascular Pathology for 2006.

John A. Parrish, MD, HST affiliated faculty, Edward Wigglesworth professor of dermatology at HMS and MGH, and head of the Department of Dermatology at MGH, has joined the National Space Biomedical Research Institute's board of directors.

Rebecca Betensky, PhD, HST affiliated faculty and associate professor of biostatistics at the Harvard School of Public Health, received the Mortimer Spiegelman Award of the American Public Health Association, which is given each year to an outstanding public health statistician under 40.

Dennis Freeman was named a MacVicar faculty fellow in honor of outstanding undergraduate teaching at MIT.

Ali Khademhosseini received funding from the Center for Integration of Medicine and Innovative Technology Science awards program for his proposal "Microencapsulation of cells within shape-controlled microgels as building blocks for tissue engineered organs." Khademhosseini also received a two-year Wallace H. Coulter Foundation Early Career Award. His focus will be microscale, bottom-up, cardiac tissue engineering.

Shiladitya Sengupta received a two-year Wallace H. Coulter Foundation Early Career Award. His focus will be multivalent hybrid-nanocells for spatiotemporal ablation of neovasculature and solid tumors. He has also received a three-year Scientist Development Grant from the American Heart Association.

Dennis Brown, MD, HST affiliated faculty and professor of medicine, HMS/MGH, received a Clifford Barger Excellence in Mentoring Award.

Collin M. Stultz, MD, PhD, received this year's Irving M. London Teaching Award, which recognizes faculty who have made outstanding contributions to the training of HST students.

Andrew Lichtman, MD, PhD, and John J. Rosowski received the Thomas A. McMahon Mentoring Award, which is presented annually to faculty for nurturing HST students in scientific and personal growth and for setting an admirable example of excellence in mentoring.

Daniel Sodickson, MD, PhD (HST MD '96 and MEMP '94), assistant professor of radiology, medicine, and health sciences and technology at HMS, BIDMC, along with

Klaas Pruessman, of the Swiss Federal Institute of Technology Zurich, was awarded the Gold Medal of the International Society for Magnetic Resonance in Medicine for their development of parallel imaging techniques in MRI. The Gold Medal, the Society's highest honor, is awarded "for pioneering scientific contributions to magnetic resonance in medicine and biology."

Isaac Kohane, MD, PhD, Lawrence J. Henderson associate professor of pediatrics and health sciences and technology, director of CHIP and of the Bioinformatics and Integrative Genomics Training Program in HST, was appointed director of the Countway Library of Medicine and codirector of a new HMS Center for Biomedical Informatics, to be housed in the Countway Library. Kohane is also principal investigator of a recently funded, \$20 million NIH Roadmap National Center for Biomedical Computing, named Informatics for Integrating Biology and the Bedside.

Bruce Rosen, MD, PhD, HMS professor of radiology at MGH, was appointed national science director of the Mental Illness and Neuroscience Discovery (MIND) Institute. The institute is a nonprofit organization dedicated to advancing the understanding of mental illness and mental disorders through the use of modern brain imaging techniques.

Daniel C. Shannon, professor of pediatrics and health sciences and technology, received this year's HST Directors' Award, recognizing him for his 24 years of service as the chair of HST's MD Admissions Committee and six years of service as the faculty director for resource development.

HST faculty members Sangeeta Bhatia, Emery Brown, Deborah Burstein, Isaac Kohane, Bruce Rosen, Kenneth Stevens, Peter Szolovits, and Laurence Young were elected to the American Institute for Medical and Biological Engineering this year.

### **Student Awards**

Irene A. Chen (MD/PhD '07) is one of 15 graduate students nationwide to receive this year's Harold M. Weintraub Graduate Student Award from the Basic Science Division of the Fred Hutchinson Cancer Research Center in Seattle. She works in the field of genomics and evolution of proteins in the Department of Molecular Biology at MGH.

Lynn Punnoose (MD '07) received a three-year Linnane Scholarship, honoring students who exhibit academic excellence and HMS community leadership. Punnoose's research area is angiogenesis.

Vivian R. Taqueti (MD '07) has been named a Schweitzer fellow by the Boston Schweitzer Fellowship Program.

Nichole S. Ullrich, MD, PhD, a Clinical Investigator Training Program student, has been awarded a Children's Hospital Faculty Career Development Fellowship by the Eleanor and Miles Shore 50th Anniversary Fellowship Program for Scholars in Medicine.

Anita Goel, PhD, an MD student, was listed among the Top 100 Technology Innovators Under 35 by *Technology Review* for developing nanotech devices for controlling proteins in DNA.

Carlos Gomez-Urbe, a student in the Medical Engineering and Medical Physics Program, won the 2005 Merck-MIT Fellowship, awarded by the MIT Computational and Systems Biology Initiative.

Theodore Marentis (MD '07) is one of 30 Paul and Daisy Soros New American fellows for 2006.

Heiko Methe, MD, postdoctoral fellow, received the 2006 Daniel Steinberg New Investigator Award in Atherosclerosis/Lipoproteins, given at the annual dinner of the *Journal of Arteriosclerosis and Vascular Biology* in April.

HST MD students Suzana Zorca and Felipe Jain received first place in their respective sections at the first annual Medical Student, Resident, and Fellow Research Symposium of the Massachusetts Medical Society. Zorca won in the basic science section for platelet carbohydrate research, and Jain in clinical research for a project on Parkinson's disease.

David O'Gorman won the Helen Carr Peake Research Prize for 2006 for his work in understanding the biophysical basis for the irregular firing patterns of auditory neurons that are driven by high-rate electrical stimulation.

Speech and Hearing Bioscience and Technology Program students Radha Kalluri and Jocelyn Songer received honorable mentions from the Helen Carr Peake Research Prize competition for their work. Kalluri's research tests existing models for the origin of otoacoustic emissions; Songer's research deals with the consequences of a newly described inner ear pathology in which there is a hole in the bone that normally covers the superior semicircular canal.

Jenny Mu received this year's HST Student Leadership Award. She was selected for her many years of dedication to improving the lives of HST students, including serving on the joint council as both representative and president and helping host and interview student candidates.

Luwam G. Semere, a graduating MD student, received the HST Multiculturalism Award in recognition of her efforts to exemplify and/or promote the spirit and practice of multiculturalism and diversity.

In a massive upset, the HST Class of 2009 dominated the HMS Student Olympics, finishing in first place out of the five student societies. The first-year students, led by cocaptains Nelson Moussazadeh and Peter Miller, were the first team in nearly 10 years to finish higher than fourth place. The highlights of the day included 100% society attendance, first place finishes in half of the Olympic events, a remarkably low 7-second average victory time in the tug-of-war, and a margin of victory so great that HST would have won even without competing in the last event.



## Future

When Dr. Irving London and his colleagues established HST 35 years ago, their experiment was a good but unproven idea. The value of the collaboration they proposed needed little justification, but their vision of integrating engineering, science, and medicine to advance human health was bold and innovative. They opened up a new frontier for exploration.

Few at that time could have predicted that within a few decades such integration would become a central force in medical science. The technologies developed at HST over the past 35 years have enabled basic science discoveries that have changed medical diagnosis and treatment. They have changed the way we see the body and understand its functions, and have revolutionized the way we treat disease.

Technology has transformed medicine to the point that HST today is no longer just a good idea. The collaborative and interdisciplinary work of HST is now prerequisite for medical discovery, advancement, and innovation. As a matter of course, many institutions have identified the integration of life sciences and engineering as a top strategic priority. Scores of new educational programs have emerged and billions of dollars have been invested in collaborative research.

Nonetheless, MIT remains a leader in this effort because so many of the individuals HST has trained have gone on to influence engineering, science, medicine, business, and government profoundly. Over the next decade, MIT will continue to be recognized as a key contributor to the improvement of human health because of the work of HST graduates, HST research at MIT, and because of the perception HST is building that it is MIT's "school" of medicine and physiology.

In the past few years, HST has focused on growing in ways that will strengthen its ability to make wide-ranging advancements in medical science. Ten years ago, HST concentrated predominantly on educational programs taught by volunteer faculty. Today, it has 65 dedicated faculty members, several of whom joined us this year. HST has developed an active alumni association and has expanded its research presence by establishing HST research enterprises at MIT and at several local teaching hospitals. Not forgetting its roots, HST has also continued to create new educational programs, launching the Graduate Education in Medical Sciences program and graduating its first bioastronautics PhD student this fall.

In the coming year, HST will continue to move towards achieving its vision through initiatives involving HST's community, programs, and infrastructure.

**Community.** HST's commitment to recruiting and retaining the highest quality students, faculty, and staff remains paramount. HST will implement recent initiatives to improve faculty life and for recruitment. These initiatives aim to mitigate the challenges intrinsic to a multi-institutional, multiprofessional, multidisciplinary faculty, and to ensure that our community reflects the society in which we live. HST will also continue to develop its relationships with the private sector and with alumni so that they are integrated into the fabric of HST.



**Programs.** HST will further develop its three research areas by enhancing its “nuclear” research organizational model and by pursuing partnerships that will accelerate the dissemination of innovation both to industry and to the clinic. HST will improve the quality of its educational programs, not through augmentation but through internal reorganization and regularization of policies and by expanding their reach to interested and presently underserved student groups: undergraduates, postdoctoral associates and fellows, women, and underrepresented minorities. The curricula in these programs are continuously reviewed and modified.

**Infrastructure.** HST will continue to move from being virtual and distributed to having a clearly identified physical space where visitors can “experience” the HST model of collaboration, a space where faculty, students, and clinicians can engage in productive interactions around educational and research initiatives that bridge disciplines and institutions to advance human health.

HST serves a vital role for MIT in facilitating the contributions of the Institute to the betterment of human health. Over 35 years it has developed an infrastructure and profile that brings MIT faculty together with Harvard faculty around educational and research programs. HST attracts students who want to be citizens of both universities so that they can take advantage of the strengths of both to develop the diagnostics and therapeutics that will transform how medicine is practiced and reduce the burden of disease.

**Martha L. Gray, PhD**

**Director**

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*More information about the Harvard-MIT Division of Health Sciences and Technology is available at <http://hst.mit.edu/>.*