

Harvard-MIT Division of Health Sciences and Technology

It is increasingly recognized that improving human health requires the integration of science, engineering, business, and medicine. This is the mission of the Harvard-MIT Division of Health Sciences and Technology (HST), and the 2004–2005 academic year was very successful in advancing those objectives for MIT. HST welcomed six new faculty, established several new research programs and resources, celebrated several awards recognizing innovation by our faculty and students, graduated another spectacular class of 70 students (and brought in 70 new ones), and continued to build strength and visibility for medicine and medical research at MIT. Harvard held the first-ever programmatic review of HST; MIT's new president, Susan Hockfield gave welcoming remarks at our annual forum, which featured alumnus Stephen K. Burley as the keynote speaker; and Barbara Gilchrest, retiring HST visiting committee chair, addressed the graduates at HST's commencement ceremonies.

HST is a community of some of the world's brightest and most innovative individuals focused on improving health for the world's population. From creating new knowledge to pioneering new cost-effective diagnostic and therapeutic strategies, to establishing new regulatory and business systems, the people of HST "bring good things to life!" We report here first on the people of HST—the faculty, the students, and the advisors, and then on the programs. Together these human and programmatic resources continue to draw the best and brightest to HST.

The HST Community

Overview

Currently, HST has 62 faculty and 212 affiliated faculty. Thirteen of the former group have primary appointments in HST, and 49 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.

In September 2004, 432 were students enrolled in HST's graduate programs, of whom 87 were newly admitted. In addition, 12 students participated in our Summer Institute programs, and 280 undergraduate and 105 graduate student members participated in 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. This year, for the first time, HST alumni have organized themselves into a council and provided the energy and vision for a weekend of educational and social events that will celebrate the success of our alumni, and mark HST's 35th anniversary, September 23–25, 2005.

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, biotechnology, venture, legal, and academic sectors.

One priority for student and faculty recruitment has been attention to diversity. Five of six faculty who joined HST over the last four years are underrepresented minority members, three of whom—Sangeeta Bhatia, Jagesh Shah, and Collin Stultz—joined the faculty in the past year.

Tables 1 and 2, respectively, describe the diversity of HST faculty and students.

Table 1. Representation of women and underrepresented minorities among Health Sciences and Technology faculty, as of 30 June 2005.

	Primary/dual appointment	Primary/dual, plus joint/second appointments
Total	13	62
Women	2	6
Underrepresented minorities	2	9

Table 2. Representation of women and underrepresented minorities among Health Sciences and Technology students, 30 June 2005.

	AY05 graduates	Continuing students	Incoming students AY06
Total	79	364	84
Women	29	110	17
Underrepresented minorities	2	20	6

HST's first Annual Faculty Poster Session was held on November 16, 2004, in the New Research Building at Harvard Medical School (HMS). The intent of the poster session was to provide HST students with a concrete way of learning about research opportunities open to them—and to promote awareness, in general, of the breadth and depth of research in HST. In addition to HST faculty posters, posters were invited from the HST alumni community. The HST Advisory Council, consisting of 40 greater Boston business people, attended as well. Forty-three posters were displayed to a predominantly student audience of 100.

For the first time in HST's history, a program review was conducted at Harvard Medical School. The focus was on HST medical education and HST's interactions with other entities at the interface between biology, engineering, and physical sciences at Harvard and MIT. The review committee included the following faculty from HMS and MIT: Chris T. Walsh, PhD, Biological Chemistry and Molecular Pharmacology, HMS; Richard O. Hynes, PhD, MIT; Dr. Robert Langer, ScD, MIT; David Golan, MD, PhD, Biological Chemistry and Molecular Pharmacology, HMS; Pam Silver, PhD, professor of systems

biology, Dana-Farber Cancer Institute; and Dan Podolsky, MD, Department of Medicine, Massachusetts General Hospital (MGH). The review reinforced the tremendous success of HST's academic programs, calling the MD program a "model for new pathway education reform." They recommended that recruitment of underrepresented minorities to our educational programs, and women faculty to head our courses needed to be an even higher priority. Further, in appointing course faculty they recommended that HST draw widely from the various departments at Harvard and MIT, particularly from the basic science departments, and warned against fulfilling all our teaching needs through HST faculty appointments.

The 18th annual HST Forum, Structure Guided Drug Discovery, featured keynote speaker Stephen K. Burley, MD '87, DPhil, chief scientific officer and senior vice president for research of Structural GenomiX, Inc., an oncology-focused drug discovery and development company. Burley described how his company works to increase the efficiency and effectiveness of the drug discovery process. The student poster session, generously funded by a grant from the Guidant Foundation, featured 75 student research posters that reflected a wide spectrum of research and represented all HST programs.

At the 5th annual HST Community Service Day, held on April 3, 2005, 40 members of the HST community chose between cleaning up Jim Rice Field, serving meals at Rosie's Place, or sorting food for the Greater Boston Food Bank.

Barbara A. Gilchrest, MD, professor and chairman of dermatology at the Boston University School of Medicine and chief of dermatology at the Boston Medical Center, delivered the keynote address at HST's graduation on June 6, 2005. 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. Rachel Forbes, who received the DDM degree, was the first student admitted to HST in conjunction with the Harvard School of Dental Medicine.

In August, HST and the MIT Entrepreneurship Center hosted the 3rd annual Celebration of Biotechnology in Kendall Square, drawing more than 700 attendees. 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.

HST and the Food and Drug Administration (FDA) launched their new five-year partnership by co-sponsoring a conference on October 19, 2004, in Rockville, MD: Adaptive Clinical Trial Design: Ready for Primetime? More than 325 people from across the country filled the auditorium, where conference leaders gathered leading stakeholders from academia, government, and industry to address the potential benefits and current challenges, focusing particularly on study sample size, and in implementing these new approaches. Proceedings from the conference will be published in *Statistics in Medicine*.

The Athinoula A. Martinos Center for Biomedical Imaging hosted the 14th biennial BIOMAG conference in August 2004. BIOMAG is the international conference for all scientists interested in biomagnetism (the study of magnetic fields produced by the brain, heart, and other organs). This event was hosted in the US for the first time in almost a decade.

Research Programs

Today, HST's research footprint includes about 25,000 square feet of space at MIT, as well as footprints at MGH, Children's Hospital Boston, and Brigham and Women's Hospital. The recent addition of hospital-based research space has promoted a new model for multi-institutional research programs, reinforcing the climate of true collaboration that distinguishes all of our work. While the research of HST's students is very broad, taking place throughout Harvard and MIT, research within HST is specifically targeted in one of three focus areas:

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

Publications by HST faculty, included as a web-accessible appendix at <http://hst.mit.edu/public/community/>, attest to the considerable impact of their research programs, such as the reporting of new biomarkers and biomarker technology that have unprecedented potential to reveal renal and hepatic toxicity; the first-ever demonstration of functional tissue engineered cardiac tissue; revelation about protein-RNA interactions critical to viral infection mechanisms; and the clarification of the role of bone-marrow-derived stem cells in the regeneration of kidney tissue after injury, to cite just a few.

In addition to the specific research contributions, several new initiatives led by HST faculty were launched, each providing important resources to the community:

— *Tissue Engineering Research Center*. HST and Tufts University received a research resource (P41) grant in tissue engineering from the National Institutes of Health (NIH). This resource provides facilities and expertise for advancing tissue engineering for clinical utility.

— *Informatics for Integrating Biology and the Bedside (I2B2)*. I2B2 is an NIH-funded National Center for Biomedical Computing involving Partners HealthCare System, and the Children's Hospital Informatics Program at HST, among others. The I2B2 Center is developing a scalable informatics framework that will bridge the clinical research data and the vast databanks arising from basic science research in order to better understand the genetic bases of complex diseases.

— *Center for Biomedical Innovation (CBI)*. Created in response to serious issues that the biomedical industry is currently facing, this a newly established center aims to be a safe harbor for collaboration among academia, government, and industry to tackle core research and policy issues that will make the process of turning advances in life science research into real-world applications safer and more effective. This center is

a collaborative effort of HST, MIT Sloan School of Management, and the schools of Engineering and Science. Led by Frank Douglas (professor of the practice in HST, Sloan, and the schools of Engineering and Science), many HST faculty and staff are taking leadership roles, particularly in the areas of safety and education. CBI leverages several prior HST initiatives, including the Biomedical Enterprise Program and the Memorandum of Understanding established between HST and FDA.

Education 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 432 students enrolled in its academic programs during AY05.

Table 3. Health Sciences and Technology Program enrollment statistics.

Degree program	Graduated AY05	Continuing students	Incoming students AY06	Total
Master's	25	39	24	88
Biomedical Enterprise Program (SM)	3	10	12	25
Biomedical Informatics Program (SM)	6	11	1	18
Clinical Investigator Training Program/Master of Science (SM)	11	12	11	34
Health Sciences and Technology Program (SM)	2	1	—	3
Master of Engineering in Biomedical Engineering Program	3	5	—	8
MD	35	160	33	228
Doctor of Dental Medicine (DMD)	1			1
Medical Sciences (MD) Program	25	77	24	126
MD/Medical Engineering and Medical Physics Program	3	9	1	13
MD/PhD	6	74	8	88
PhD	22	170	27	219
Medical Engineering and Medical Physics Program	16	103	21	140
Radiological Sciences Joint Program	—	8	—	8
Speech and Hearing Bioscience and Technology Training Program	6	59	6	71
Total	82	369	84	535

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

New Initiatives

Bioastronautics Training Program

Principle investigator Laurence Young received an \$80,000 grant from the National Space Biomedical Research Institute for phase 1 development of a graduate bioastronautics training program within HST's Medical Engineering and Medical Physics (MEMP) Program. The program aims to help students develop the breadth of training necessary to gain competence and appreciation of the space life sciences (SLS) and to help fill the growing gap for SLS researchers in NASA and the aerospace industry.

Summer Scholars Program

Since 2003, HST has offered a variety of summer programs that aim to expose talented undergraduates, especially 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 I2B2. These summer scholars participate in some aspects of the MIT Summer Research Program (MSRP), which has a 20-year history of bringing members of underrepresented minorities and individuals from economically disadvantaged backgrounds to MIT for a summer research experience. Finally, in 2005 another five MSRP students were placed for summer internships in the labs of HST faculty members.

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 on how to prepare and present research findings through both individual tutorials and workshops. 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 multiple opportunities provided to network with their laboratory members, 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 fifth year, BioMatrix, the HST-sponsored mentoring community for undergrads and graduate students, had a student membership of 385, again attracting more than 50 new freshmen each year. The monthly dinner programs offered this year included interviewing skills, learning to market 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, Esq., of the HST Advisory Board, and institutional support from the offices of MIT's deans for student life, graduate students, and undergraduate education.

eLearning

HST's eLearning website, <http://hstelearning.mit.edu/>, was launched in December 2004. With funding from the VaNTH Engineering Research Center (ERC), iCampus, and the Center for Experimental Pharmacology and Therapeutics, faculty, staff, and students have constructed courses and course modules. Courses available on the web include Good Practices in Clinical Research, Study Design for Clinical Researchers, Infectious Diseases of Transplantation, and Fungal Infections: Virtual Grand Rounds. Course modules, following the How People Learn pedagogy, provide important learning experiences for students and include Microscale Diffusion, Fourier Spectral Analysis, and Renal Hemodynamics. The mission of the eLearning website is to provide 24-hour accessibility from around the world to the site content, provide interactive capability for practice and feedback, offer individual customization, provide web graphic capabilities that will help users to visualize data, and to provide data that can be updated as needed.

New or Significantly Modified HST Courses

HST.452J Statistical Physics in Biology (H-Level Grad Credit)
 HST.508 Quantitative Genomics (H-Level Grad Credit)
 HST 590 Biomedical Engineering Seminar Series: Topics in Medical Ethics and Responsible Conduct in Research
 HST.855 Special Subject in Biomedical Enterprise: Clinical Experience 2
 HST.422J/9.22J A Clinical Approach to the Human Brain (new)
 HST.424J/9.24J Diseases of the Nervous System (new)
 HST.491 Reviewing Biomedical Literature (new)
 HST.727J/6.543J/9.587J/24.941J The Lexicon and Its Features (new)
 HST.949J/6.877J Computational Evolutionary Biology (new)
 HST.986 Special Subject in Biomedical Enterprise: The Legal Framework of Biomedical Enterprise (new, but same as 15.648)
 HST.557 Introduction to Molecular Simulation
 HST.580 Data Acquisition and Reconstruction in MRI

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 HMS, 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 the /vice president for research at MIT, as well as to the HMS executive dean for academic programs and the dean of HMS. Richard N. Mitchell, MD, PhD, and Lee Gehrke, PhD, serve as the division's associate directors.

After serving on the HST Personnel Committee and chairing the HST Faculty Search Committee for more than four years, Lee Gehrke, PhD, was appointed associate director for faculty in August 2004. In this new role, Professor Gehrke oversees faculty affairs within HST, with a special emphasis on mentoring and supporting new faculty and on raising public awareness of the faculty's unique and broad-based research capabilities. Additional goals are to enhance the sense of community among HST's geographically dispersed faculty, to coordinate the utilization of faculty expertise toward fulfilling HST strategic goals, and to place additional emphasis on mentoring and enhancing the career development of junior faculty.

HST staff have made outstanding contributions to the HST mission and throughout the past year the following staff were recognized for their individual outstanding contribution: Marsha Warren, program administrator; Carol Campbell, administrative assistant; Amy Mageria, administrative assistant; Lisa Coviello, administrative assistant; Mario Casal, administrative assistant; Susan Kangiser, administrative assistant; Lora Maurer, faculty affairs coordinator; Cathy Modica, administrative assistant; Bernd Comjean, fiscal officer; Pam McGill, administrative assistant; Patty Cunningham, program officer; and Jon Suparyo, administrative assistant. In June, we acknowledged the retirement of Carol Campbell, administrative assistant II, who retired after 17 years of service to HST and 35 years' employment at MIT.

Bernd Comjean, fiscal officer won a 2005 Infinite Mile Award from the Office of the Provost and the Office of the Associate Provost and Vice President for Research. Bernd has earned tremendous respect and trust from all his colleagues by expertly managing a myriad of issues, ensuring the smooth operation of financial arrangements for research, teaching, student support, and administration at both MIT and Harvard.

Julie E. Greenberg, PhD '94, became the new director of education and academic affairs in July. Julie directs and manages HST's educational research portfolio, which is comprised of (1) specific educational research projects, (2) educational assessment and pedagogical design within the context of a funded education project, and (3) teaching and educational initiatives. Julie has been actively involved in educational research through the NSF-funded VaNTH ERC for about 6 years and her role and leadership for all VaNTH-related activities at MIT.

New Appointments, Promotions, Awards, and Honors

New Appointments to Faculty

In spring 2005, HST welcomed returning alumna Sangeeta Bhatia, PhD ('97), MD ('99), to a dual appointment as associate professor (with tenure) of health sciences and technology and associate professor of electrical engineering and computer science. Sangeeta recruited her entire lab from University of California–San Diego to join her at MIT in the Laboratory for Multiscale Regenerative Technologies, currently housed in E19, where the lab has gotten off to an enthusiastic start. Sangeeta's research focuses on the interface between living and synthetic systems at the micro- and nanoscale, focusing on the interactions between hepatocytes and their microenvironment and on microfabrication tool development to improve cellular therapies for liver disease.

In winter 2005, HST was delighted to welcome Thomas Byrne, MD, as visiting clinical professor of neurology and health sciences and technology at HMS and MGH. Tom has been teaching in several HST courses cross-listed with the Department of Brain and Cognitive Sciences (BCS) and mentoring both undergraduates in HST's BioMatrix program and HST MD students considering neurology clerkships. His research focuses on the clinical aspects of cancer involving the nervous system, including primary brain tumors and the neurological complications of cancer and anticancer therapies. Tom will also participate in HST's Martinos Center for Biomedical Imaging.

In July 2004, HST welcomed David E. Cohen, PhD, MD ('87), as associate professor of medicine and health sciences and technology. David comes to HST from Albert Einstein College of Medicine, where he was associate professor of medicine and biochemistry in the Marion Bessin Liver Research Center. While at the center, he conducted innovative studies in the fields of molecular biophysics, biology, and genetics of biliary lipid metabolism, including a focus on cholesterol transfer from plasma to bile. David's research interests also include the impact of obesity on hepatic cholesterol metabolism. David will also serve as the next chair of the HST MD Admissions Committee.

We also welcomed Frank Douglas, PhD, MD, as professor of the practice in the MIT schools of Management, Engineering, and Science and the Harvard-MIT Division of Health Sciences and Technology. Frank will serve as executive director of MIT's new Center for Biomedical Innovation (CBI), bringing together representatives from industry, government, and academia in a "safe harbor" setting to facilitate cross-institutional and cross-disciplinary dialogue. CBI's goals—to explore, identify, research, and enable the implementation of innovative methodologies and approaches that transform the discovery, development and delivery of accessible therapeutics, diagnostics and services—are closely aligned with HST's, and HST is actively involved in CBI. In HST, Frank is, naturally, working most closely with our joint program with the MIT Sloan School, the Biomedical Enterprise Program.

In July 2005, HST welcomed Professor John Gabrieli from Stanford University, where he had been professor of psychology since 1988. John has a dual appointment in HST and BCS as Grover Herman professor of health sciences and technology and professor of brain and cognitive sciences. John will also serve as associate director of HST's Martinos

Center for Biomedical Imaging and will be working with Elfar Adalsteinsson and others to build the MIT footprint of the Martinos Center. He will also serve as codirector, with HST affiliated faculty member Ravi Thadhani, of MIT's Clinical Research Center. John's research focuses on the neural mechanisms of memory, cognition, and emotion in the human brain, and how those mechanisms are disrupted in neurological and psychiatric disorders.

In March 2005, HST welcomed returning alumnus Jagesh Shah, PhD '99, as assistant professor of systems biology, medicine, and health sciences and technology at HMS and the Brigham and Women's Hospital (BWH). Jagesh comes from a postdoctoral appointment at University of California–San Diego and will direct the newly formed Laboratory for Cellular Systems Biology and Molecular Imaging in the Renal Division at BWH. His research focuses on mitosis, cytoskeletal dynamics, and synthetic genetic and proteomic networks with a focus on applying modern photonic methods and computational approaches to understanding cellular phenomena and disease states. In addition, Jagesh will play a leadership role in HST's BioMatrix program.

As part of the 1999 Strategic Plan, HST launched a new faculty structure and appointment policies, in part to formally recognize those faculty with primary appointments in other academic units who devoted significant time on behalf of HST. The expectations for these jointly appointed faculty is analogous to the expectation for dual appointments, including regular service in teaching, advising, and committee work. In this new structure, the HST faculty comprises those with primary, dual, or joint appointments. The multistep appointment process includes a case, outside letters, formal approval by the chair of the primary department, and review through the regular faculty review process in HST and at MIT or HMS; the time from initiation to completion can take more than a year. Given the substantial effort, we intentionally distributed the transition to this new structure over five years. In this, the third of the five years, the group of appointments that were completed include:

- Donald Eddington, PhD, associate professor of otology and laryngology, and health sciences and technology, HMS, Massachusetts Eye and Ear Infirmary (MEEI); director, Cochlear Implant Research Laboratory, MEEI; principle research scientist, Research Laboratory of Electronics (RLE), MIT
- Robert Hillman, PhD, associate professor of surgery and health sciences and technology, HMS, MGH; research affiliate, RLE, MIT; codirector/research director, Center for Laryngeal Surgery and Voice Rehabilitation, MGH
- Jennifer Melcher, PhD, assistant professor of otology and laryngology, and health sciences and technology, HMS, MEEI
- Christopher Shera, PhD, associate professor of otology and laryngology, and health sciences and technology, HMS, MEEI

New Appointments to the HST Advisory Council

Several new appointments were made to the HST Advisory Council, including:

- Natacha DePaola, PhD, professor and acting chair, Biomedical Engineering Department, Rensselaer Polytechnic Institute, Jonsson Engineering Center

- Michael N. Helmus, PhD, senior vice president, Biopharma, Advance Nanotech, Inc.
- Scott Sarazen, senior vice president, life sciences, MassDevelopment

Faculty Promotions

We are delighted to announce the promotion of four HST faculty members this year.

- Primary faculty member Elazer Edelman, MD, PhD, professor of health sciences and technology at MIT, was promoted to professor of medicine at HMS, BWH.
- Robert Langer has been named Institute Professor at MIT, the highest faculty appointment given to MIT faculty members, for extraordinary scientific accomplishment and exemplary service to the MIT community.
- Primary faculty member Leonid Mirny, PhD, has been promoted to associate professor of health sciences and technology and physics at MIT.

Faculty Awards and Honors

- HST dual faculty member, Elfar Adalsteinsson, PhD, was awarded the Robert J. Shillman career development professorship by the Department of Electrical Engineering and Computer Science (EECS).
- HST director Joseph Bonventre, MD, PhD, was ranked as one of three top mentors in the US in a 2004 American Association for the Advancement of Science online survey of postdoctoral fellows. Joe, with postdoctoral fellow Vishal Vaidya, also received the award for Outstanding Presentation in Risk Assessment at the 44th annual meeting of the Society of Toxicology in March 2005.
- Dennis Freeman, PhD, associate professor of electrical engineering and computer science, won the Bose Award for Excellence in Teaching at MIT, established in 1990 to recognize outstanding contributions to undergraduate education by the faculty of MIT's School of Engineering.
- HST director Martha Gray, PhD, was elected chair of the College of Fellows of the American Institute for Medical and Biological Engineering. Martha was also the featured speaker at Case Western Reserve University's Allen H. Ford Distinguished Visiting Professor Lecture Program, which is designed to maintain the university's leading role in facilitating interaction between researchers in medicine and engineering.
- Isaac S. Kohane, MD, PhD, associate professor of pediatrics and health sciences and technology, HMS, Children's Hospital Boston (CHB) and director of the HST/Children's Hospital Informatics Program, was awarded the Lawrence J. Henderson chair in health sciences and technology and was elected to membership in the American Association for Clinical Investigation.
- Fiona Murray, PhD, assistant professor, MIT Sloan School of Management, and HST affiliate faculty member, was one of six researchers chosen to receive the new Sloan Industry Studies Fellowships.
- Robert Langer won the nation's richest prize for medicine and biomedical research, the \$500,000 Albany Medical Center Prize for his work with polymers, implantable drug delivery devices, and tissue engineering.

- Frederick J. Schoen, MD, PhD, professor of pathology and health sciences and technology at HMS and BWH, is coeditor of the second edition of *Biomaterials Science: An Introduction to Materials in Medicine*, published by Elsevier/Academic Press in July.
- Robert F. Padera, MD, PhD, HST affiliated faculty member and instructor in pathology at HMS was selected as the recipient of the HST Irving M. London Teaching Award. This award is given to HST faculty members who display excellence and dedication to teaching the biomedical sciences curriculum that is central to HST's educational goals.
- Andrew J. Oxenham, lecturer in health sciences and technology, and principal research scientist, RLE, MIT, was awarded the HST Thomas A. McMahon Mentoring Award, for his tireless mentoring of HST students both inside and outside the classroom.

Student Research Fellowship Awards

- American Heart Association Predoctoral Fellowship—Pak Wai (Patrick) Au
- Fulbright Fellowship—Yoko Saikachi
- Hertz Foundation Fellowships (new and continuing)—Andrew Levin, E. Courtenay Wilson
- Howard Hughes Medical Institute Award (new and continuing)—David Berry, Timothy Lu, Ryuji Suzuki, Anna Szary, Viviany Taqueti
- Hugh Hampton Young Memorial Fellowship—Fabio A. Thiers
- Jack Kent Cooke Foundation Fellowship—Bradley N. Buran
- Korean Foundation Fellowship—Jinkuk Kim
- NASA-Graduate Science Research Program Fellowship—John Ng, Erika Brown Wagner
- National Defense Science and Engineering Graduate Student Fellowship—Georg Gerber, Amy Shi
- NIH Individual National Research Service Award—Daniel Shub, Darren Whiten
- National Science Foundation Fellowships (new and continuing)—Joaquin Blaya, Kathie Dionisio, Grace Young Kim, Mara MacDonald, Sylaja Murikipudi, David Nguyen, Biju Parekkadan, Adam Rosenthal, Lauryn R. Zipse
- Susan G. Komen Breast Cancer Foundation Fellowship—Ricky Tong
- Whitaker Foundation Fellowships (new and continuing)—Gil Alterovitz, Steven K. Charles, David A. Eavarone, Kevin R. King, Andrew G. Richardson, Christina E. Silcox, Kyle Smith, Joshua Tam, Erika Brown Wagner, Juwell W. Wu, Peter I. Wu
- Zakhartchenko Fellowship—David O’Gorman

Student Community Leadership and Teaching Awards

- Students selected the chairs of the MD and PhD councils, Steven Bailey and Paul George, respectively as the joint recipients of HST's student leadership award.
- Martin Zalesak, PhD student, received the Graduate Student Council Graduate Teaching Award for excellence in teaching a graduate-level course, for his work

as a teaching assistant for HST.583 Functional Magnetic Resonance Imaging: Data Acquisition and Analysis.

- Mike Folkert, PhD student, won a Karl Taylor Compton Prize “in recognition of excellent achievements in citizenship and devotion to the welfare of MIT [and which] reflects outstanding contributions to the MIT community as a whole, sustained over a significant number of years.”
- Cristie Charles, spouse of HST MEMPH student Steven Charles, was awarded the Laya Wiesner Community Award. This award is given to a member or friend of the MIT community for conspicuously effective service that reflects Mrs. Wiesner’s concerns for enhancing life at MIT and the world. Ms. Charles is the Eastgate Parents Coordinator.

Student Competitive Industry Awards

- Two HST students, Baruch Schori and Kathleen Sienko, of the Balico team, won the 2005 Robert P. Goldberg Grand Prize at the annual MIT 50K Entrepreneurship Competition. Balico designed a wearable vibrotactile balance aid designed to assist people whose ability to balance has become compromised by disease or age.
- David Berry, MD-PhD student, won the 2005 \$30,000 Lemelson-MIT Student Prize for inventing promising new ways to treat both stroke and cancer patients. Working with Professor Ram Sasisekharan, Berry and colleagues conceived the idea of a new protein called dimeric FGF2, which is involved in the formation of new blood vessels. Berry’s studies of internalized heparin have also led to a promising new technique for treating cancer. Additionally, in October 2004, David Berry was a finalist along with 13 other students from around the country in the Collegiate Inventors Competition at the National Inventors Hall of Fame.

Alumni Notes

HST alumnus David C. Page, MD ‘84, was elected to membership in the National Academy of Sciences and appointed interim director of the Whitehead Institute for Biomedical Research.

Rebecca Richards-Kortum, PhD ‘90, a pioneer in the development of noninvasive screening methods for cervical cancers and precancers, will become the chair of Rice University’s Department of Bioengineering in fall 2005,

Vamsi Mootha, MD ‘98, assistant professor of systems biology at HMS and assistant professor of medicine at MGH has received a Burroughs Wellcome Fund Career Award in the Biomedical Sciences. He was also named a 2004 MacArthur Fellow by the John D. and Catherine T. MacArthur Foundation.

Future

When HST was established 35 years ago, the pioneering vision was to integrate engineering, science, and medicine to advance human health. Now many institutions have identified the integration of life sciences and engineering as a top strategic priority, promoting scores of new educational programs and a more than a billion dollars of

investment in research infrastructure. MIT has been and ought to continue to be a leader in this effort. Through HST alone, MIT has trained more than 1,000 individuals, a great many of whom are world leaders who have had a significant impact in engineering, science, medicine, business, and government. Over the next decade, MIT should become recognized as a key player in the worldwide imperative to advance the quality and quantity of life. HST is the academic unit at MIT for whom that is a central goal. Over the next decade, HST will evolve so that it is perceived as MIT's "school" of medicine and physiology.

Ten years ago, HST was very different. It focused only on education, had no ties to industry, was operated by volunteer affiliated faculty (since only six faculty had academic appointments in HST), had no alumni network, and no research presence (beyond the individual research programs of its few faculty). Over the past decade, HST has recruited more than 10 new faculty, established a new model for faculty appointments, established HST research enterprises at MIT and the teaching hospitals, built a network of advisors and alumni, and continued to innovate in its educational programs. Most of these changes have materialized in the last 18 months, positioning HST to more broadly realize its promise to its stakeholder institutions.

In the coming year, we will continue to move towards achieving our 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 for 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 candidates, women, and underrepresented minorities. The curricula in these programs are continuously review and modified.

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

In summary, HST can serve 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

Edward Hood Taplin Professor of Medical and Electrical Engineering

Joseph V Bonventre, MD, PhD

Director

Robert H. Ebert Professor of Molecular Medicine

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