Institute for Medical Engineering and Science

Launched in July 2012, the Institute for Medical Engineering and Science (IMES) aims to serve as an integrative force across MIT and establish an intellectual hub of research and education at the convergence of engineering, science, and translational and clinical medicine. It also seeks to create strategic partnerships with collaborating hospitals and industry that can transform health care and medicine, and to provide a robust home for the Harvard-MIT Division of Health Sciences and Technology (HST). Achievement of these goals is expected to benefit all units at MIT and collaborating institutions in the Boston area. In support of these ambitions, IMES draws on HST's 40-plus years of providing world-class training to leaders in medicine and health care. HST's MD and PhD educational programs and its partnership with the Harvard Medical School (HMS) form a significant historical, structural, and administrative underpinning that is important for IMES' potential and growth.

Since its inception, IMES has worked to establish a strategic partnership between MIT and Massachusetts General Hospital (MGH) to confront some major challenges to human health. IMES has also recruited four outstanding faculty members to MIT who work at the intersection of engineering, science, and medicine. These faculty members have been recruited in partnership with Electrical Engineering and Computer Science (EECS), Chemical Engineering, Biological Engineering, Chemistry, the Ragon Institute, the Picower Institute, and the Broad Institute, and they will soon move into newly renovated space in Building E25. In partnership with HMS, IMES will also play a significant role in educating physician-scientists and physician-engineers who can integrate approaches from the physical sciences and engineering with the practice and science of medicine.

Faculty Research and Accomplishments

Professor Elfar Adalsteinsson's magnetic resonance imaging (MRI) group conducts research in medical imaging focused on estimation of brain oxygenation parameters by MRI, parallel transmission technology and applications in MRI, image reconstruction methods for accelerated acquisitions through undersampling, and imaging of the unborn child. In collaborations with colleagues in EECS and at the MGH Martinos Center for Biomedical Imaging, the group proposed and demonstrated a methodology for a comprehensive full-wave electromagnetic analysis of arbitrary MRI transmit coils for realistic body models. Previous approaches required many hours of simulation times, and the proposed method is fast enough to be applied in automatic procedures for optimization of coil designs. This work was presented at the 2014 meeting of the International Society for Magnetic Resonance in Medicine in Milan, Italy.

Professor Adalsteinsson is associate director of the Madrid-MIT M+Visión Consortium, which recruited the third class of 10 fellows in the past year. The M+Visión fellows are active in several diverse and interdisciplinary research projects in biomedical imaging and technology that cut across imaging modalities.

Professor Sangeeta N. Bhatia's laboratory developed a low-cost urine test for detecting early stages of disease. This "paper diagnostic" relies on nanoparticles that interact with enzymes called proteases, each of which can trigger the release of hundreds of biomarkers that are then easily detectable in a patient's urine. Bhatia's group had first described this approach of synthetic biomarkers in 2012, when the approach relied on a highly specialized instrument, a mass spectrometer. In order to apply it to the developing world, they adapted the system to a paper test that could be performed on unprocessed samples in a rural setting without the need for any specialized equipment. Bhatia envisions that the simple readout could even be transmitted to a remote caregiver by a picture on a mobile phone. Bhatia and her colleagues have applied their system to detection of pulmonary embolisms (blood clots in the lung), colon cancer, and liver fibrosis and are moving toward a clinical translation with the help of a commercialization grant from the Deshpande Center for Technological Innovation and clinical collaborators both near (MGH and Columbia University) and far (Tata Memorial Hospital in Mumbai).

Professor Emery Brown and his colleagues developed precise neurophysiological characterizations of how propofol changes electroencephalogram activity as patients become unconscious under general anesthesia. These characterizations show that a fundamental way in which anesthetics alter arousal is by inducing oscillations that impair the ability of brain circuits to represent and transmit information. Professor Brown's group also developed and successfully tested in a rodent model a closed-loop anesthetic delivery system that precisely maintains the anesthetic state of the brain. The group demonstrated the system by showing that it could be used to precisely maintain a state of medical coma, a drug-induced state of profound brain inactivation that is used therapeutically to treat intractable seizures and brain swelling following brain injuries. Professor Brown is seeking approval from the Food and Drug Administration to test the control system in humans.

Professor Brown served on the National Institutes of Health (NIH) Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative working group, appointed by NIH director Francis Collins to develop a 5- to 10-year blueprint for neuroscience research in the United States. In addition, he was elected this year to the National Academy of Sciences.

Professor Arup K. Chakraborty continued his research at the convergence of physical science, engineering, and medicine. Perhaps the two most important findings emerging from his laboratory this year were the completion of his lab's efforts to determine the fitness landscape of all HIV proteins and the development of a general in silico method to study the vaccination protocols that may be best to pursue for generating broadly neutralizing antibodies against HIV. His lab also discovered (with Ed Palmer) the mechanisms that are responsible for the threshold half-life required for agonists to trigger T cells. The Chakraborty lab's 2014 efforts were published in leading journals such as *Cell* and *Science*.

Professor Chakraborty continues to direct IMES; successes in this regard included the hiring of two new faculty members (one with Biological Engineering and the Broad Institute and one with Chemistry). He successfully led the effort to create the MIT-

MGH strategic alliance and raise philanthropic support for the $25 million gift that led to the establishment of the Center for Microbiome Informatics and Therapeutics. Chakraborty continues to serve the National Academy of Engineering, the American Academy of Arts & Sciences, the Dreyfus Foundation, and the US Defense Science Board in numerous ways.

Professor Richard Cohen worked with colleagues at the Sloan School of Management to help launch a new Sloan-based certificate program in health care. As part of this new program, Professor Cohen created and taught a new course: 15.S67 Medicine for Managers and Entrepreneurs Proseminar. This course is a requirement for the certificate program but is also open to MIT students broadly. The course is designed to provide a background in the scientific and clinical aspects of biomedicine for students with an interest in managing or starting a biomedical company. Each class involved a presentation by a physician/scientist on the basic science and clinical aspects of a medical topic followed by a presentation by a CEO or other principal of a company involved in developing products in the same area. Students were assigned reading on the medical and business aspects of each topic and wrote short papers each week addressing a critical issue in the assigned area. In addition, as a term project each student had to propose and present an idea for a biomedical business that addressed a compelling clinical need. In addition to 15.S67, Professor Cohen taught two biomedical company strategy courses that satisfied elective requirements for the health care certificate.

Professor John Gabrieli's group addressed issues in education and the two most common neurodevelopmental disorders, dyslexia and attention deficit hyperactivity disorder (ADHD). In a study with 1,300 eighth graders, they discovered that the schools students attended influenced their academic achievement but not cognitive skills predicting long-term educational and occupational success. These findings have motivated new school efforts to foster these cognitive skills. In another study, the group examined nearly 1,500 kindergartners in Boston-area schools and performed brain imaging with 180 of these prereading students. The anatomic microstructure of white-matter pathways correlated with language abilities important for learning to read. Brain measures may help identify children at risk for dyslexia and promote early interventions before reading failure. In a third study, the Gabrieli group discovered the first evidence of a brain difference in young adults who maintain versus remit from their childhood ADHD diagnosis. This is the first biomarker that distinguishes current from prior ADHD.

The search for genetic variants that increase the risk of a particular disorder is an important focus in medical research. Genetic studies of disease typically examine genetic markers and their correlation with the incidence of a disease to identify locations in the genome associated with the disorder of interest. Heterogeneity in the effects of genetic variation on disease processes presents a significant obstacle for robust detection of associations between genetic codes and disease phenotypes. Professor Polina Golland's research takes advantage of anatomical information revealed via noninvasive medical imaging to improve the sensitivity of genetic studies and to uncover associations of genetic and imaging markers with the disease of interest.

The research program of professor Martha Gray and the Biomedical Technology Innovation Group focuses on formalizing approaches for needs-driven innovation, from the choice of problem to solve to increasing the speed and likelihood of translation and adoption. The group does this primarily in the context of predoctoral and postdoctoral research training. Seven new projects were initiated this year, bringing the group to 18 total projects since January 2012. These projects have resulted in dozens of publications, 20 invention disclosures, 13 patents, and one start-up. Highlights of the projects closest to translation include the following: Team Eye (recently incorporated as Plenoptika) showed in clinical studies that the device the team invented can provide an eyeglass prescription at the push of a button, Team Cell's members were selected as finalists in Mass Challenge to commercialize their newly demonstrated platform for cell analysis, and Team PET's novel approach to signal analysis provides a new capability to measure multiple tracers simultaneously.

Professor Thomas Heldt joined the MIT faculty in IMES and the Department of Electrical Engineering and Computer Science in July 2013. Using physiologically based dynamic models, his group leverages multivariate bedside monitoring data to understand the physiology of the injured brain, to improve diagnoses, and to accelerate treatment decisions in the critically ill. To achieve these aims, he has developed extensive collaborations for data collection at Boston-area hospitals.

A key research accomplishment of Professor Heldt's group over the past year has been the deployment of data collection systems in the neurocritical care units at Boston Children's Hospital (under new NIH funding) and Beth Israel Deaconess Medical Center and the continued validation of the group's noninvasive approach to estimation of intracranial pressure, as reported at the 2013 International Intracranial Pressure and Brain Monitoring Conference and the 2014 annual meeting of the American Association of Neurological Surgeons. Another milestone was the publication of a novel approach to differentiating congestive heart failure from chronic obstructive pulmonary disease on the basis of automated computational analysis of the shape of the waveform of the exhaled CO_2 concentration (capnogram).

Also, graduate student James Noraky was named to the 2014 class of Siebel scholars, Varesh Prasad received a National Defense Engineering and Science Graduate Fellowship, and Rebecca Miloszyk was named to the Helen Carr Peake research assistantship at MIT's Research Laboratory of Electronics.

Professor Robert Langer received honorary degrees from Ben Gurion University, Tel Aviv University, Boston University, the University of Western Ontario, and Drexel University. He was elected as a fellow of the American Association for the Advancement of Science (AAAS), a foreign corresponding member of the Austrian Academy of Science, and an honorary fellow of the American College of Clinical Pharmacology. Professor Langer received the Wolf Prize in Chemistry, the United States National Medal of Technology and Innovation (for 2011), the Breakthrough Prize in Life Science, the Kyoto Prize, the Chemical Heritage Foundation's Biotechnology Heritage Award, the American Institute of Chemists' Chemical Pioneer Award, the ETH Zurich Chemical Engineering Medal, the Mack Memorial Award, the RUSNANOPRIZE Nanotechnology

International Prize, the American College of Clinical Pharmacology's Distinguished Investigator Award, the Julio Palmaz Award for Innovation in Healthcare and the Biosciences, the Industrial Research Institute Medal, the IEEE Medal for Innovations in Healthcare Technology, the Society of Biomaterials' Founders Award, and the MDEA Lifetime Achievement Award.

Professor Langer presented the Darsh Wasan Lecture (Illinois Institute of Technology), the George S. Hammond Lecture (Bates College), the Edward Mack Jr. Memorial Award Lecture (Ohio State University), the Axalta Lecture (University of Pennsylvania), the inaugural Thomas H. Chilton Lecture (DuPont Central Research and Development), the Warren L. McCabe Lecture (North Carolina State University), the Reed Izatt and James Christensen Lecture (Brigham Young University), and the Professor Dame Julia Polak Inaugural Lecture (Imperial College).

Professor Roger Mark and the Laboratory of Computational Physiology, in collaboration with the Beth Israel Deaconess Medical Center, have created and maintained an important public intensive care database, MIMIC II, which is now used by more than 1,000 researchers worldwide. Over the past 12 months, the group has had 10 papers published or accepted for publication documenting original examples of secondary use of clinical data from MIMIC. Ten more manuscripts are currently under review. The laboratory jointly organized big data in health care conferences in Paris (July), Madrid (November), and Medellin (February). But the highlight of the academic year was the Critical Data Marathon and Conference held at MIT in January. The conference's theme was to address concerns that big data will only augment the problem of unreliable research. Jeffrey Drazen, editor-in-chief of the *New England Journal of Medicine*, and John Ioannidis, director of the Meta-Research Innovation Center at Stanford, were the keynote speakers. Ten teams participated in the associated MIMIC data marathon, including one team from London.

Dr. Philip Sharp was involved in many activities relating to the MIT community during the past year, including teaching (7.60 Cell Biology and one lecture annually in HST.140 Molecular Medicine) and advising. Also, he served on the Department of Biology's graduate committee, many thesis committees, and advisory boards for the MIT Museum, the Simons Center for the Social Brain, the Klarman Cell Observatory, the Stanley Foundation Program, the Whitehead Institute, the Broad Institute, and IMES. In February, he became chair of the board of AAAS after serving as its president the previous year. He is the principal investigator in a productive lab of six postdocs, seven graduate students, and two Undergraduate Research Opportunities Program (UROP) students. Sharp and his lab recently published some very exciting results on how cells make sense of transcriptional direction. They hope further investigations in this area of study will reveal how cells carry out their normal functions and how they change in malignancy.

Professor Charles G. Sodini leads the Medical Electronic Device Realization Center, which works to establish a partnership among the microelectronics industry, the medical devices industry, medical professionals, and MIT. The MGH-MIT strategic partnership aims to bring together approaches from engineering and basic science with clinical

medicine and to foster rapid translation from bedside to bench and back to bedside. Bringing together MGH clinicians with MIT engineers can lead to new devices and algorithms with the potential to transform the efficiency with which disease states are diagnosed and optimal intervention strategies determined, thus improving the efficiency of overall health care delivery. Thirty-three proposals were submitted in response to a request for action for the first identified challenge: making diagnosis cost effective and accurate and guiding individual clinical decisions based on real-time monitoring and statistical models of massive patient data sets. It is anticipated that six proposals will be funded with teams from MIT and MGH in September 2014. The selected teams will be expected to employ unique and highly innovative approaches with a path to further funding at the end of these seed grants.

Professor Collin Stultz and the Computational Biophysics Group are focused on developing an improved understanding of disease processes at the molecular level and using these new insights to build novel therapeutic tools. Their approach involves both building computational/theoretical models and conducting biochemical experiments designed to test and refine these models. The group's research is currently concentrated in two broad areas. First, they have developed a deep interest in understanding the structure of intrinsically disordered proteins (IDPs) that play a role in neurodegenerative disorders. The ultimate goal of these studies is to use this improved understanding to design molecules that prevent the neurotoxic aggregates that are formed from these proteins. Second, they strive to develop automated computational tools that can identify patients at increased risk of death after adverse cardiovascular events (e.g., heart attack, stroke). Below is a brief outline of the group's contributions in each of these areas.

Since many disordered proteins form neurotoxic aggregates in the brains of patients with neurodegenerative disorders, an understanding of the "structure" of these proteins is of paramount importance. The group's goal is to use the information derived from such structural studies to design drugs that prevent the formation of pathological aggregates. However, since these proteins are inherently very flexible, they cannot be described by a single structure. Instead, one needs to model them as an ensemble of different structures.

Constructing ensembles for disordered proteins is inherently plagued by several problems. For example, the number of experimental observations typically pales in comparison to the number of degrees of freedom in an IDP ensemble. Furthermore, it is difficult to limit the degrees of freedom a priori in the ensemble, for example by utilizing a relatively small structural library, while still being able to capture the inherent structural heterogeneity of an IDP. As a result, a degeneracy problem arises in that there are many different sets of structures and weights that fit the experimental data. Indeed, findings have shown that agreement with experimental data does not guarantee that an ensemble is accurate.

The group continues to be actively involved in developing methods for the analysis of IDPs that directly address this degeneracy issue. They have developed a novel method for modeling intrinsically disordered systems that uses Bayesian statistics to quantify the uncertainty in the underlying structural ensemble. For a given IDP, the constructed

ensemble corresponds to a coarse-grained representation of the protein, and the number of structures in the ensemble is related to the resolution at which one wishes to view the energy landscape of the IDP. A unique and powerful feature of the group's approach is that it provides a built-in error measure that allows one to assess the accuracy of the constructed ensemble. Therefore, their method stands in contrast to other approaches that construct a single ensemble of structures to model the unfolded state without any error estimates. They have applied their methods to a number of disordered proteins that play a role in neurodegenerative disorders, and they believe that their work has revealed new insights into these systems. They have also developed a variational Bayes strategy that enables them to apply these methods to larger systems in a fraction of the central processing unit time that would be required using standard Bayes formalism.

Professor Stultz and his team have continued their work on using electrocardiographic data to identify patients at high risk of adverse cardiovascular events. They currently have at least two provisional patents that have been submitted during the last year.

The graduate Bioastronautics Training Program, part of the Medical Engineering and Medical Physics (MEMP) program in HST, was approved for another five years of funding and given a very favorable review by its sponsor, the National Space Biomedical Research Institute (NSBRI). The program, directed by Laurence Retman Young, prepares graduates to work in the area of human space exploration; it admits one or two new students annually and is approximately six years in duration. Professor Young received the NSBRI Pioneer Award, which recognizes individuals "whose efforts and accomplishments have blazed new trails on behalf of the Institute, its partnership with NASA and the space biomedical community at large." Twelve students attended the annual NASA/NSBRI Human Research Program investigators' meeting, and two of them won runner-up awards at the meeting.

Academic Program

Graduate Degree Programs

HST is among the largest biomedical engineering and physician scientist training programs in the United States, with 305 students enrolled in its graduate degree programs during AY2014:

- 184 MD and MD/PhD students
- 103 MEMP PhD students, including five MEMP/MD students
- 23 Speech and Hearing Bioscience and Technology (SHBT) program PhD students

HST graduate students work with faculty and affiliated faculty members from MIT, Harvard, and affiliated teaching hospitals. Whether pursuing careers in medicine, research, industry, or government, HST graduates have made outstanding contributions to advances in human health care.

The MEMP PhD program trains students as engineers or physical scientists who also possess extensive knowledge of medical sciences. The program provides preclinical and clinical training to students. On average, students complete the PhD program in six years, and in some cases they also pursue an MD.

The HST MD program is aimed at students interested in a research-based medical career. While eligible to complete the program in four years, many students take an optional fifth year to engage in more extensive research. Approximately 80% of HST MD alumni follow a career path in academia.

GEMS Certificate Program

The Graduate Education in Medical Sciences (GEMS) certificate program is open to doctoral students in MIT's Schools of Engineering and Science who are interested in working at the intersection where engineering and science meet medicine and real-world health care. GEMS runs concurrently with the normal course of an MIT PhD program and can be completed in two years without prolonging a typical PhD career. In addition to coursework in pathology and pathophysiology, participants attend seminars with HST students and engage in an individually tailored clinical experiences. GEMS students learn how advances in basic science and engineering become medically relevant therapies and tools for the improvement of human health while developing a professional network that includes medical researchers, clinicians, and physician-scientists.

GEMS was initially established with support from a Howard Hughes Medical Institute (HHMI) program that encouraged graduate schools to integrate medical knowledge and an understanding of clinical practice into PhD curricula. Thirty-two MIT PhD students enrolled in GEMS between 2007 and 2011. The program, which became dormant after the HHMI funding ended, was revitalized after the founding of IMES and enrolled nine new students in AY2014.

IDEA^2

Problem identification and definition are integral to graduate education and to innovation, yet the process of learning to select and develop a research question is largely unstructured for most graduate students. This is especially challenging for students in interdisciplinary fields and for those who wish to engage in research that will translate rapidly from lab to clinic. The overarching objective of IDEA^2 is to provide a structured process that guides, mentors, and supports HST students as they learn to define and develop research questions that can impact human health.

IDEA^2 accepts applications from HST students who have identified a specific biomedical research problem but are still early in their training. Following a review process, successful applicants are matched with mentors from outside their research labs, who guide the students as they refine their research proposals. Participating students benefit from an early experience in independently defining, articulating, and defending a research idea while simultaneously developing and engaging a network of advisors from different disciplines, professions, and sectors.

IDEA^2 is supported by the generosity of the Peter C. Farrell (1967) Fund and provides partial financial support to participating students. In AY2014, IDEA^2 distributed $124,000 in student support and individually matched 11 students with 33 mentors selected from a pool of established biomedical entrepreneurs, practicing clinicians, and accomplished scientists/engineers in academia and industry.

Summer Institute

Patterned after MIT's Summer Research Program, HST offers two specialized Summer Institute programs, one in biomedical optics (offered in collaboration with the Wellman Center for Photomedicine at Massachusetts General Hospital) and the other in bioinformatics (offered in collaboration with the i2b2 National Center for Biomedical Computing at Brigham and Women's Hospital). Thirty-three students participated in these two programs in summer 2013, and 38 are enrolled for summer 2014.

These programs offer a unique opportunity for outstanding undergraduate college students considering a career in biomedical engineering and/or medical science. Through hands-on research and in-depth lectures, participants learn about either biomedical optics or bioinformatics and engage in the application of these fields to solving problems in human health. Through individual tutorials and workshops, students learn to communicate their research findings effectively in written and oral formats. Shared living arrangements and a variety of technical and social activities enable Summer Institute participants to develop a network of peers and build strong, enduring connections with faculty working in the field.

Faculty Mentoring and Teaching Awards

Dr. Bohdan Pomahac was honored with HST's Seidman Prize for MD Research Mentorship.

Dr. Thomas Byrne received the HST Irving M. London Teaching Award.

Dr. Konstantina Stankovic was honored with HST's Thomas A. McMahon Mentoring Award.

Student Honors and Awards

Allen Cheng, MD/PhD, led the winning third-prize team in the **Innovations in Primary Healthcare Prize competition sponsored by** the MGH Ambulatory Practice of the Future program in collaboration with MIT's Center for Integration of Medicine and Innovative Technology. Other team members included Ashwin Nathan (MD '13), Dafang Zhang (MD '13), and Eli Cohen '09.

Arnav Chhabra, a PhD candidate in the MEMP program, received a Paul & Daisy Soros Fellowship for New Americans.

MEMP program PhD candidate Lina Colucci received a National Science Foundation Graduate Research Program Fellowship.

MD candidate Mai Dao was awarded an HHMI Summer Medical Fellowship.

Daniel Day, a PhD candidate in the MEMP program, received a Hugh Hampton Young Memorial Fund Fellowship from MIT's Office of the Dean for Graduate Education.

MEMP program PhD candidate Atray Dixit received a National Defense Science and Engineering Graduate Fellowship.

Rachel Ellman and Jordan Spatz, PhD candidates in the Bioastronautics Training Program, each won one of the two runner-up awards for best poster at the NASA Human Research Program investigators' workshop in Galveston, TX.

MEMP program PhD candidate Or Gadish received an Elie Shaio Memorial Award from MIT's Office of the Dean for Graduate Education.

MD candidate Nicholas Gonzalez Castro won an HMS Dean's Community Service Student Award.

Melissa Gymrek, a PhD candidate in the MEMP program, was awarded a Collamore-Rogers Fellowship from MIT's Office of the Dean for Graduate Education.

MD candidate Daniel Haldar received funding to work in pediatric oncology research as a St. Baldrick's Summer Fellow.

MD candidates Tru-Khang Dinh, Allison Hamilos, George Huang, Daniel Oh, and Ryan Park were awarded an HHMI Medical Research Fellowship.

MEMP program PhD candidate Pavitra Krishnaswamy won the Best Student Paper Award at the 35th Annual International Conference of the IEEE Engineering and Biology Society, held in July in Osaka, Japan.

MD candidates Brian Li, James Luccarelli, and Sarvagna Patel were awarded a David G. Nathan Summer Fellowship in Pediatric Hematology/Oncology.

Ashley Mateus, a PhD candidate in the MEMP program, was a finalist in the MIT $100K Competition.

MEMP program PhD candidate David Miranda-Nieves received a National Defense Science and Engineering Graduate Fellowship. He was also offered but declined a National Science Foundation Graduate Research Program Fellowship.

MD candidate Molly Plovanich won the Seidman Prize for Outstanding HST Medical Student Thesis.

Varesh Prasad, a PhD candidate in the MEMP program, received a National Defense Science and Engineering Graduate Fellowship.

MD candidate Avanthi Raghavan was awarded an HHMI Medical Research Fellowship. She was also offered an award by the Sarnoff Cardiovascular Research Foundation but declined.

Avanti Raghavan, Jasmine Thum, and Caleb Yeung, all second-year MD candidates, were honored with a speaking engagement or poster awards at the 74th Soma Weiss Student Research Day at HMS.

MD/PhD candidate Sana Raoof was awarded a Paul & Daisy Soros Fellowship for New Americans.

MD candidate Emily Rosen was awarded summer funding from the American Society of Hematology.

Megan Shan, a PhD candidate in the MEMP program, was chosen as one of the five MIT delegates sponsored by MIT's Office of the Dean for Graduate Education to attend the 5th Annual Womensphere Emerging Leaders Global Summit at Columbia University.

MEMP program PhD candidate Carolin Unglert was awarded a SPIE Optics & Photonics Education Scholarship.

Nikhil Vadhavkar, a PhD candidate in the MEMP program, was awarded a NASA Space Technology Research Fellowship.

MD candidate David Wen Rui Wang received an American Heart Association award.

MD/PhD candidate Winston Yan was awarded a Paul & Daisy Soros Fellowship for New Americans.

Nathaniel Zuk, a PhD candidate in the SHBT program, was awarded the 2014–2015 Amelia Peabody Scholarship.

Staff Awards

Patricia Cunningham, IMES and HST academic programs administrator, was the 2014 recipient of Harvard Medical School's Richard A. Gillis Award for Excellence in Medical Education.

Events

HST Faculty Poster Session

Approximately 125 people attended the ninth annual HST Faculty Poster Session, held on October 16, 2013, at the Courtyard Cafe at Harvard Medical School. Fifty-five faculty posters, representing 50 labs, were on exhibit. Some posters represented broad research programs, while others presented specific research projects; some included student coauthors. This annual event familiarizes faculty members with their colleagues' research and allows them to recruit students to their laboratories. It also assists students beginning the process of selecting laboratories and mentors for their research.

HST Forum

The 27th HST Forum was held on April 10, 2014, at the Tosteson Medical Education Center at Harvard Medical School. This event highlights the depth and breadth of HST student research for applicants admitted to HST's MD and PhD programs as well as current students, faculty, staff, and other members of the Harvard and MIT communities.

This year approximately 150 people attended the forum, including 44 students who presented posters on their current research. The poster session was followed by a keynote address given jointly by HMS professors Jonathan and Christine Seidman and their advisee, HST MD/PhD student Alexander Bick, who treated the audience to a unique view of a dynamic mentor/mentee relationship. The joint address was well received by current and prospective members of the HST community.

In the context of an impressive array of articulately presented student research, the following students received the Martha Gray Prize for Excellence in Research in the categories named:

- Steven Castleberry (MEMP), Regenerative Medicine
- Sheldon J.J. Kwok (MD/PhD program), Imaging and Optics
- Jared Mayers (MD/PhD program), Physiology and Systems Biology
- Michael S. Rooney (MEMP), Bioinformatics and Integrative Genomics
- Priya Srikanth (MD/PhD program), Cell and Molecular Biology
- Andrew Warren (MEMP), Biomedical Devices

Arup K. Chakraborty, Director
Robert T. Haslam Professor of Chemical Engineering, Chemistry, Physics, and Biological Engineering