



Cover: On White Coat Day, first-year medical student Sun Jin Lee dons the iconic symbol of her future profession with an assist from (left to right) Holmes Society Associate Master Sara Fazio, associate professor of medicine at Harvard Medical School, and Senior Tutor Peggy Timothe, instructor in oral health policy and epidemiology at Harvard School of Dental Medicine. *This page:* Medical students on the steps of Gordon Hall.



At Harvard Medical School and its 17 affiliated hospitals and research institutions, faculty, staff and students are engaged in a quest to alleviate human suffering caused by disease.

2010-2011

THE DEAN'S REPORT

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“Harvard Medical School’s campus is a vibrant training ground for tomorrow’s practitioners, innovators, and leaders in science and the healing arts.”



JEFFREY S. FLIER
Dean of the Faculty of Medicine



STATE OF THE SCHOOL

Message from the Dean



Those who say youth is wasted on the young have never visited Harvard Medical School on White Coat Day. Each year on this joyful day in August, 165 first-year medical students don the iconic short coat, a symbol of their future profession.

As they climb the steps of Gordon Hall by the dozens, it is impossible to feel anything but pride and a rising sense of optimism, so inspiring is the potential these young people represent.

On this and every day of the year, the School's campus is a vibrant training ground for tomorrow's practitioners, innovators, and leaders in science and the healing arts. While hundreds of young men and women pursue medical and doctoral degrees, many more are engaged in postgraduate training. In the classrooms and corridors of the School's Quadrangle, one detects a certain energy and excitement, the kind that accompanies learning.

Each spring at commencement, graduates in crimson and black robes step up to claim degrees. Come fall, hundreds more arrive with aspirations high. To serve as dean of this remarkable institution—or as a member of its faculty or staff—is a privilege and an invigorating experience, one that keeps my own learning curve steep.

While the academic year 2009–2010 saw progress in all aspects of our mission, certain milestones in education were especially memorable. In June, we conferred degrees upon the first class to complete our New

Integrated Curriculum, the centerpiece of medical education reforms for which we began planning a decade ago, and which are a major highlight of this Dean's Report. This past October, our Division of Medical Sciences graduate programs—crucibles for the world's brightest minds in realms in cell biology to virology—received top rankings in a 10-year study by the National Research Council.

I am often asked what traits make our student body so exceptional. It is not merely outstanding intellect—although competition for admission is high; in 2010, for example, just four applicants in 100 gained admission to our MD degree program. Nor is diversity our students' defining attribute—although this year, our medical students come from 32 U.S. states and 12 countries, and an impressive 34 percent are underrepresented minorities. HMS students are optimists and idealists, certainly, but this too is not unique. What sets them apart, I believe, is that so many bear the hallmarks of leadership. They are determined to advance their chosen field, be they aspiring scientists, physicians, policymakers or a combination of these.

Take Aakash Shah, for example, a first-year medical student. A Ursinus College graduate chosen in October for a Rhodes Scholarship, Shah has an enviable record of personal integrity and academic achievement. But he offers something more: the motivation to change the world.

Aware of the gross health inequalities around the globe, including in India, where he has studied environmental health problems in the slums, Shah—who told the

Harvard Gazette he was “surprised, humbled, grateful and excited” to hear from the Rhodes Scholarship committee—hopes to work at the interface of medicine, academe and policymaking, translating classroom lessons and experience into health solutions for the real world. Like so many who choose to study at HMS, Shah has what it takes to be a leader worth following.

ENSURING STABILITY, RENEWING STRENGTH

In 2010, the HMS community remained united in a common mission: to serve society by training future clinicians and scientists, by probing the frontiers of basic science, and by using our discoveries to alleviate suffering and advance human health. Each year, it is my pleasure to highlight through this report the major successes on our campus, referred to as the Quad, as well as achievements of our distinguished affiliated teaching hospitals and research institutes, 17 in all.

Although implementation of our strategic planning goals initially slowed in the wake of the global economic recession, I am pleased to report the School now rests on a more stable financial footing. Currently we are at work on a long-range plan to secure a sustainable financial future. Our progress results in part from changes in our operations, improved performance of the School's endowment, successful competition among researchers for American Recovery and Reinvestment Act funding, and an agreement with our affiliates that promotes our joint mission through a new financial structure.

Harvard President Drew Gilpin Faust (right) celebrated the announcement of a new Center for Primary Care at HMS.



A NEW VISION FOR PRIMARY CARE

As this country debated health reform legislation early in 2010, our faculty and students were intent on addressing the crisis-level shortage of primary care physicians. Despite evidence that health systems with a primary care orientation provide better care at lower cost, primary care receives less funding in proportion to specialized disciplines in this country than in any other developed nation. Practitioners are generally underpaid and overworked compared with medical specialists. Many are disillusioned, and fewer and fewer students are entering primary care practice.

To address these issues, I engaged an advisory group of faculty and students to develop a detailed set of recommendations. Meanwhile, the entire HMS community engaged in fruitful discussions during a series of town hall-style assemblies. In October, thanks to these efforts and a generous \$30 million gift from an anonymous donor, the HMS community celebrated the announcement

of a new Center for Primary Care—one geared toward transforming primary care education, research and delivery systems.

Our planned center, which is without precedent in the United States, will have both physical and virtual dimensions, serving as a docking point for students, residents, fellows and faculty. The center will become a hub for training leaders in primary care and health systems education, research and policy; it will also drive innovation in care delivery through rigorous research and scholarship. To lead this effort, I am overseeing a search for a director with a national profile who will join the HMS departments of Health Care Policy and/or Global Health and Social Medicine and have a secondary hospital appointment as well. By raising the profile and capacity of primary care here at Harvard, we expect to have a far-reaching, even global, impact.

A BLUEPRINT FOR BIOMEDICAL RESEARCH

In 2010, as in every year, HMS researchers published hundreds of pathbreaking studies. Among many that made headlines, scientists decoded the Neanderthal genome, identified a mechanism by which a genetic mutation for the autism-like Angelman syndrome hinders cognitive function, and linked overproduction of a key Alzheimer's disease protein to a flaw in the immune response.

In a decision that will help shape the direction of biomedical research across the Quad and at our affiliates, I created a new post—that of executive dean for research—and filled it with an esteemed scientist and leader: HMS alumnus William Chin, Class of 1972. No one is better equipped to join me, along with leaders

of other Harvard schools and our teaching hospitals, in conceiving and implementing a vision for discovery that will speed the translation of basic science discoveries into new classes of therapies to ease human suffering.

Of course, leadership in the basic sciences remains a hallmark of Quad research. In 2010 we realigned several departments to permit much-needed renovations and the expansion of our laboratories, a move in part prompted by the halt in construction of the University's science complex in Allston. This ambitious \$80 million undertaking will do much to encourage cross-departmental work, enhance productivity and facilitate translational efforts.

As a first step, a number of our faculty within Pathology joined colleagues in other departments—Genetics, Cell Biology, Neurobiology—whose interests complement their own. Several others will shift, together with members of what is now Microbiology and



Molecular Genetics, into a renamed Microbiology and Immunobiology Department, relocating to renovated labs within our New Research and Harvard Institute of Medicine buildings. These changes will in turn make way for growth in Systems Biology and Neurobiology. We expect great things to spring from these new configurations.

Meanwhile, space for research has expanded in Cambridge this year. Within the multi-institutional Harvard Stem Cell Institute and the University's Department of Stem Cell and Regenerative Biology, researchers are using the power of stem cell biology to understand and ultimately treat disease. In one stunning breakthrough, researchers found a faster, better way to turn adult cells into embryonic-like induced pluripotent cells, which have the potential to become virtually any cell type. Their feat raises hopes for growing new tissue types to match a patient's own, perhaps far sooner than previously anticipated.

EXPLORING HUMAN DISEASE MECHANISMS

Our commitment to advancing translational research remains unwavering. In a demonstration of our resolve, this past fall we launched Harvard Immunology, a pan-Harvard effort that will capitalize on the unparalleled expertise of many world-class immunologists. Under this umbrella falls the new Harvard Institute of Translational Immunology, known as HITI, the first in a series of planned institutes focused on applying research findings to the improvement of medicine.

Our ultimate goal for HITI is to prevent and treat a wide range of conditions in which immunologic mechanisms are involved, including arthritis, type 1 diabetes and multiple sclerosis. To fulfill that hope, we will bring together experts in immune and inflammatory systems,

host defense and abnormal immune states, as well as train a new generation of researchers to move results out of the lab, through clinical trials and into the physician's pharmaceutical arsenal. Thanks to support from the Leona M. and Harry B. Helmsley Charitable Trust, HITI will jumpstart new work in type 1 diabetes and Crohn's disease, both autoimmune conditions.

BRIDGING ACADEME AND INDUSTRY

Bridging the gap between lab bench and bedside is no easy task. Unfortunately, a persistent obstacle to translational research is that neither academe nor industries that develop pharmaceuticals are, by themselves, equipped to develop treatments and tools for eradicating many complex human diseases. To solve the riddles of atherosclerosis or Alzheimer's, we need breakthroughs born of both free-thinking scholarship and market-driven entrepreneurship. In 2010, we took important steps to revise policies that promote faculty-industry interactions while safeguarding our integrity and minimizing the risk of conflicts of interest.

The changes restrict corporate influence over continuing medical education, for example, and will require faculty members to post on a public website financial transactions involving companies with which they engage in research. The policies continue to permit faculty members to receive funding from industry for basic and clinical research, hold stock in health and pharmaceutical concerns, serve as paid consultants and found new companies as long as such activities are fully transparent and consistent with policy guidelines.

The value of academe-industry collaborations came to the fore this fall as a virulent cholera bacterium ravaged Haiti. Using third-generation technology developed by Pacific Biosciences, researchers at this



California company, HMS and the island nation rapidly sequenced DNA from the cholera strain and determined definitively that the strain matched bacterial samples from distant South Asia and not those from neighboring Latin America, as many had anticipated. This finding has ramifications for limiting the potential spread of disease in and beyond Haiti, suggesting, for example, that a mass vaccination campaign might prove valuable.

Another compelling site of potential academe-industry collaboration is the Wyss Institute for Biologically Inspired Engineering, for which HMS serves as the administrative hub. Wyss researchers borrow engineering principles from the natural world to invent materials, nanotechnologies and devices to counter disease and disability. In 2010, researchers devised a microchip that mimics living, breathing lung tissue, potentially useful for testing new drugs. They also created self-assembling devices from DNA that, by mimicking viruses, might one day be used to move drugs into diseased cells.



HARVARD CATALYST: ENGINE OF INNOVATION

No better engine for scientific collaboration exists than the Harvard Clinical and Translational Science Center, known as Harvard Catalyst. The quest of this flagship initiative is to advance translational and patient-based studies by catalyzing interactions among thousands of faculty across HMS and its affiliates, Harvard and other Boston institutions. Armed with competitive pilot grants, investigators in disciplines never before juxtaposed are now pooling their ideas. For example, one team is devising more efficient methods of synthesizing tracer agents to improve imaging useful for diagnosing Parkinson's disease and cancer. Another group aims to invent molecular methods for identifying infectious pathogens in patient samples within hours or days instead of weeks.

In the fall of 2010, the Harvard Catalyst Linkages Program, directed by Eva Guinan, HMS associate

professor of pediatrics at Dana-Farber Cancer Institute, unveiled the results of a remarkable experiment called the Type 1 Diabetes Ideation Challenge. This contest invited more than 50,000 faculty, students and staff at HMS, its affiliated hospitals and Harvard's other schools to propose questions that have not yet been answered about type 1 diabetes. The goal is to open new lines of scientific inquiry surrounding ancient disease foes. After reviewing 191 entries, a panel of 240 reviewers awarded \$2,500 to each of 12 winners, among them a Harvard undergraduate and an HMS human resources manager. Requests for research proposals based on the winning entries were announced within weeks. In the coming years, we hope to issue more challenges that tap the wisdom of crowds.

CHAMPIONING FACULTY DEVELOPMENT AND DIVERSITY

A paramount goal at HMS is to recruit and retain the best faculty, which has grown rapidly, from 3,000 members in 1980 to nearly 12,000 today. To create an even more vibrant and diverse faculty and trainee community, this fall I accepted a comprehensive set of recommendations from a task force led by our Office for Academic and Clinical Affairs to better cultivate the careers of junior and senior faculty while also removing barriers to recruiting women and underrepresented minorities.

Working collaboratively, the offices for Faculty Affairs and for Diversity and Community Partnership will enrich fellowship, counseling and leadership training opportunities. Faculty Affairs has already begun to streamline the process by which members move up the academic ladder, shifting the process online to render it faster and more transparent. A new orientation inaugurated this past fall introduced new faculty to strategies for connecting to HMS and enhancing career success.

Fifth-year medical student Eric Zwemer enchants 5-year-old Elichannel with magic tricks at Children's Hospital Boston.

Our recruitment processes for every position must be fair and open to ensure we attract the broadest pool of candidates possible. Today I am proud to say that HMS is home to more underrepresented minority faculty than any other U.S. medical school, thanks in part to a set of pipeline programs developed by the Office for Diversity and Community Partnership. However, we must redouble our efforts to support their rise, and that of women, into tenured professorships and leadership posts.

PHILANTHROPY FUELS PROGRESS

That HMS remains a vital, creative and productive community owes much to support from numerous generous alumni, supporters and friends. Their gifts and pledges support student scholarships, fellowships for junior faculty, innovative research, and programs in teaching and learning. In 2010, in addition to the \$30 million gift to launch the HMS Center for Primary Care, these leadership gifts generated a range of new initiatives:



- From the Bertarelli Foundation, led by President Ernesto Bertarelli, HMS received \$9 million to join the Swiss university École Polytechnique Fédérale de Lausanne (EPFL) in forging the Bertarelli Program in Translational Neuroscience and Neuroengineering. This program aims to improve the quality of life for people with neurological disabilities by building a pathway from device design at EPFL to clinical testing at HMS. This extraordinary gift includes an endowment for the Bertarelli Professorship in Translational Medical Science, with Executive Dean for Research William Chin as its first incumbent.
- The Juvenile Diabetes Research Foundation committed \$4.4 million to the lab of HMS Professor of Pathology Diane Mathis, which is exploring molecular and cellular immune system elements that go awry in type 1 diabetes yet might be harnessed for therapeutic ends.
- Leonard D. Schaeffer, a member of our Board of Fellows, committed \$4 million to the Leonard D.

Schaeffer Professorship in Health Care Policy, supporting research on critical health issues and the training of tomorrow's policymakers.

- Martha Crowninshield, a longtime friend of HMS, is supporting genetics studies in a quest to cure multiple sclerosis with a \$1 million commitment.
- Stephen Kahn, HMS Class of 1999, pledged \$1 million to create the Abundance Project for Global Health. With HMS, Partners In Health and the Global Health Delivery Program, centered at Brigham and Women's Hospital, the project will support clinicians, medical researchers and teachers in providing care and training practitioners in resource-poor communities.
- An anonymous donor gave more than \$1.1 million to our Program in Medical Education to foster among students a more holistic and humanistic clinical mindset.
- Alumnus Roman DeSanctis, Class of 1955, endowed a new financial aid fund through his estate plan to bring talented students to HMS regardless of their economic circumstances.

BUILDING A TRULY GLOBAL SOCIETY

I am ever more conscious of Harvard Medical School's global reach and its potential to impact lives all around the planet. In Dubai and Portugal, we have exchange programs for trainees and platforms for launching collaborations in research. Within our Department of Global Health and Social Medicine, we are creating a slate of training programs that will equip new generations of physicians and policymakers for partnerships with governments in Rwanda, Peru and elsewhere to help build equitable, high-quality care systems. In Haiti, long before the devastating earthquake and cholera epidemic of 2010, our faculty



helped government leaders design and staff a network of clinics and hospitals. Today their work is more important than ever.

Such efforts offer lessons for us at home. In redressing the inequity and cost inefficiencies that bedevil U.S. health care, our faculty, staff, students and alumni will apply a steady influx of new knowledge to the task.

Harvard Medical School, with its network of collaborators near and far, is an epicenter of learning and discovery that I believe has no equal. We have only begun to draw upon a vast well of innovation and expertise. I am proud of, and grateful to, all members of this community. Together we can take pride in shared accomplishments and look forward to synergies not yet realized. ☺



*M*aster Class 2010

MILESTONES IN MEDICAL EDUCATION REFORM

A century ago, the physician–educator Abraham Flexner issued a scathing critique of American medical education. While Flexner praised an emphasis on science at Harvard and a few other schools, he characterized medical training in general as an apprenticeship that lacked formal admission criteria, a unified curriculum and assessment standards. Flexner’s reforms ultimately transformed physician education around the world.

Furthering reforms, in the 1980s HMS adopted problem-based teaching, an innovation other medical schools began to emulate. In 2006, the School began rolling out a new slate of reforms through its New Integrated Curriculum, and in 2010, HMS conferred medical degrees upon the first class to complete all four years of training under the curriculum.

Today, an introductory course orients students to their roles as future physicians, presenting patients on day one. In the two preclinical years, courses in the basic and population sciences are more thoroughly integrated with basic clinical instruction. And new requirements in social medicine, medical ethics and health care policy help lay the foundation for 21st-century practice.

In year three, students no longer rotate among several Harvard-affiliated hospitals. Instead, they spend most of their time at a single institution, becoming familiar with its unique culture while benefitting from a longitudinal,





multidisciplinary curriculum and long-standing teaching and mentoring relationships. The restructured fourth year provides more time for electives in clinical medicine and the sciences, as well as for scholarly work.

In the spirit of continuous quality improvement, reforms are ongoing under the leadership of HMS Dean for Medical Education and Carl W. Walter Professor of Medicine Jules Dienstag, guided by these key principles:

- Integrate science and clinical medicine throughout the student experience.
- Increase academic rigor in the biological, social and population sciences.
- Strengthen student mentoring relationships with clinical faculty.
- Give students greater opportunity to forge relationships with patients while managing illnesses from the outpatient clinic to the hospital.
- Help students build knowledge through independent scholarship.

Today's graduates are equipped to respond to—and to spearhead—changes in medicine and science while navigating a health system that demands repair. The next wave of advances in patient care will come from minds trained to innovate.

The following stories highlight features of a Harvard Medical School education. Through the eyes of a few students and their teachers, we glimpse the future. 🌟



EARLY IN HIS FIRST YEAR AT HMS, BRAD CROTTY, Class of 2007, approached Mr. B with a mixture of shyness and apprehension. The 91-year-old patient and artist was, after all, a trailblazer in abstract expressionism. Now he suffered from depression, fatigue and complications from a broken vertebra. Crotty's assignment was to learn everything he could about Mr. B's case—medical status, career, family, world view—and write a confidential report, or casebook, as part of an innovative elective called the Mentored Clinical Casebook Project, which asks students to examine “the whole patient” with help from a senior physician and a faculty mentor.

At that first meeting, Crotty broached the issue of depression; mostly, however, the two sat in awkward silence. Gradually, over lunches in Boston and at Mr. B's home north of the city, Crotty earned the patient's trust by not asking too many questions. The artist opened up, not only about his medical condition, but also about his childhood, his career and his ideas on life, death, family and art as well as medicine, a matter on which he sometimes found himself at odds with his physician of five decades, A. Stone Freedberg, who was also Crotty's mentor.

It was heady stuff—and it made a lasting impression. “I had the privilege of being able to delve deeply into Mr. B's life,” says Crotty, who now practices internal medicine at Beth Israel Deaconess Medical Center. “Listening can be hard for physicians these days, but unless you understand your patient, your treatment is not going to be effective.”

That's exactly the lesson the course attempts to impart. “Every patient has a heart and liver, and as a student writes a book about it, they integrate all that knowledge,” says Dean for Students Nancy Oriol, an HMS graduate herself. Students learn quickly that patients are more than a collection of body parts; each

Learning to listen well

As part of an innovative elective, students are asked to examine “the whole patient”—medical status, career, family, world view—with help from a senior physician and a faculty mentor.






has a unique intellectual stance and an emotional outlook that may tangibly affect his or her recovery, Oriol says. “No Mentored Casebook graduate will ever be able to see a patient as the gall bladder in Room 6.”

About 10 percent of first-year medical students enroll in the elective course, which other medical schools have begun to emulate. As one student wrote in an evaluation, “I saw how organic and indivisible a person is.” The experience can also be life-changing for patients, who volunteer to be followed closely. One student bonded over music with a 13-year-old burn patient from the Caribbean, making him mix tapes and holding his hand through repeated surgeries, recalls Lisa Mayer, manager of the Mentored Casebook course. “That student became a hero to this young boy, seeing him through the most frightening months of his life,” Mayer says. “This course is a win-win for everyone involved.”

Relationships forged between student, patient and mentor often continue long after graduation. Crotty checked on Mr. B’s progress, celebrating along with Freedberg when the artist rose above his depression to resume painting. “Dr. Freedberg never stopped asking questions,” says Crotty of his role model, who, like his patient, recently died. “I think that’s why he got to know Mr. B really well. He didn’t have any preconceived notions of what the answers would be.”

Crotty has taken those lessons to heart. He is scheduling more time with new patients, he says, and he is helping pilot a program through which hospital residents make home visits. Although he has long outgrown his reserve, Crotty still practices the art of silence. “Doctors do patients a disservice by interrupting them,” he says. “Often patients already know what works and what doesn’t. If you listen closely, you can better integrate the right treatment into their lives.” Patients, after all, are rarely an open book. ❁



HMS graduate Brad Crotty, now an internal medicine physician at Beth Israel Deaconess Medical Center, enjoys getting to know his patients well.



AS HARVARD MEDICAL SCHOOL STUDENT Varsha Keelara embarked upon her patient-care rotations at Massachusetts General Hospital in year three of her medical training, she knew she could be certain of at least one thing: where the hospital's bathrooms were. That's because, beginning in 2008, HMS radically revised its third-year curriculum so that students could do most of their clinical training at just one of the School's renowned clinical affiliates—Mass General, Brigham and Women's Hospital, or Beth Israel Deaconess Medical Center, in Boston, or Cambridge Health Alliance, in Cambridge—instead of rotating among three or four institutions.


The revamped third year at HMS, dubbed the Principal Clinical Experience, or PCE, allows students to spend less time orienting themselves to new locations and institutional cultures and more time focusing on medicine. "It makes a big difference," Keelara says, "in that you focus on important aspects of a rotation such as radiology or neurology, rather than which elevator buttons you should press."

What Keelara didn't anticipate, however, was how working side by side with the same doctors for 12 months would deepen her sense of belonging. "We felt like we were at our home base," she says of Mass General. "Having a community of friendly faces around was a huge confidence booster."

A medical student's first clinical experience is an exciting milestone, a chance to put textbook learning into practice. At the same time, it can be overwhelming, says Kate Treadway, the Gerald S. Foster Academy Associate Professor of Medicine and an internist at Mass General who, with other medical education reformers at HMS, championed the PCE. When students split their rotations among institutions, they "can get lost during a time that is extremely important in their formation as

Fostering a community

The revamped third year at HMS, dubbed the Principal Clinical Experience, allows students to spend less time orienting themselves to new locations and institutional cultures, and more time focusing on medicine.

 During a rotation in obstetrics/gynecology at Brigham and Women's Hospital early in his principal clinical year, HMS student Michael Garcia checks on new mother Erin Bouthiette.





of caregivers



physicians,” she says. “They are exposed to lots of events that are pretty intense, and they face them alone.”

Treadway recalls one student who didn’t speak about the death of a patient until an intern mentioned, two days later, how sad she felt. “This came as a relief for the student, who wasn’t even sure it was OK to feel upset,” Treadway says. “Students struggle a great deal with what it means to be a doctor.” The PCE assigns students a non-grading mentor, to whom they can bring such questions. All attend weekly classroom sessions that present a common curriculum, foster camaraderie and offer opportunities to compare notes on different rotations.

These interdisciplinary meetings, Treadway says, give students the chance to see how branches of medicine are integrated. For Keelara, who in 2010 began her fourth year at HMS, that integrated understanding of medicine deepened as the year-long PCE unfolded and she encountered some patients and their families repeatedly.

During her obstetrics and gynecology rotation, for example, Keelara saw a pregnant 15-year-old with uncontrolled diabetes. Months later, during her pediatric rotation, Keelara saw the girl’s newborn daughter, who was diagnosed with a constriction of the heart’s aorta, a defect that probably resulted from her mother’s disease. “Having made a connection with the mom made it so much easier for me to talk with her about her baby,” says Keelara, who has since set her sights on a career in cardiology.

Fostering lasting connections is exactly what the PCE is intended to do, Treadway says. “We’ve tried to make clear to students at each of the four affiliates how they can keep track of patients they’ve been involved with,” she says. “Many students discover they have preexisting relationships with patients who are now being readmitted on another service. This continuum makes for kinder, more compassionate, more empathetic physicians—precisely the kind Harvard Medical School seeks to create.” 🌟

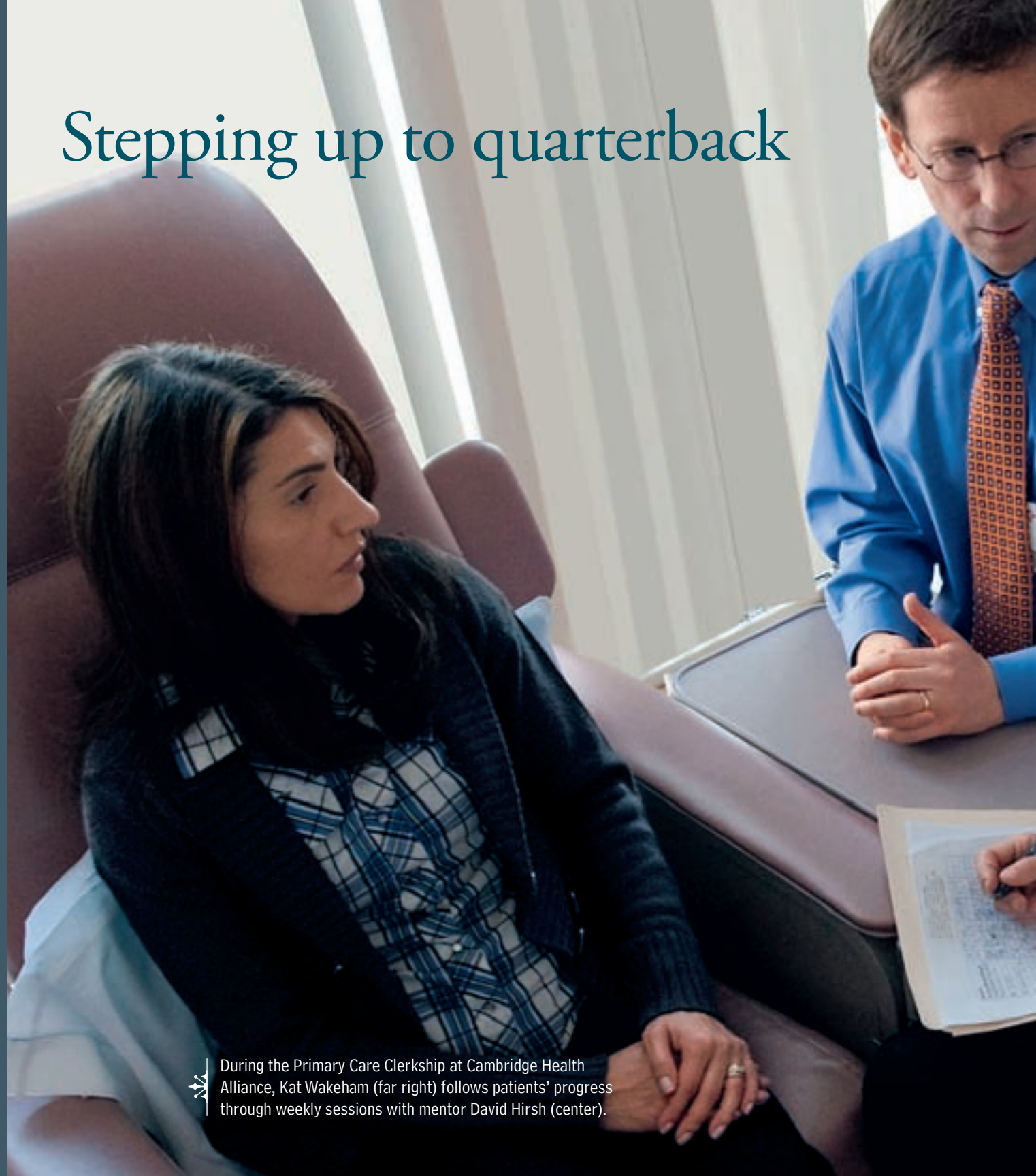


PRIMARY CARE SOMETIMES SEEMS LIKE the family farm of U.S. medical education: praised by all, yet rapidly disappearing. Many students ultimately opt for specialties, lured by perceptions of prestige and bigger paychecks. In part as a result, 66 million Americans live in regions short on primary care doctors, according to estimates from the U.S. Department of Health and Human Services. Such statistics have spurred Harvard Medical School and an anonymous philanthropist to lay plans for a new \$30 million Center for Primary Care, one that aims to rehabilitate the field through leadership in research and education.

That transformative gift deepens a long commitment at HMS to education in primary care. For more than a decade, HMS has introduced students to the field through its innovative Primary Care Clerkship, or PCC. A third-year rotation, the PCC runs for a full eight months, with students working closely with assigned preceptors weekly to see patients during office visits and develop treatment plans. Over time, students are exposed to the rhythms of an outpatient practice. “Students hopefully get to know several patients well and see the progression of illnesses or the resolutions of problems,” says PCC Director Rebecca Cunningham, a primary care physician at Brigham and Women’s Hospital. “It’s very different from the moment-in-time snapshots they see in a hospital setting.”

Cunningham was a member of the first PCC class, in 1996, and credits the experience with her decision to enter the field. No one can predict how many 2010 MD graduates from HMS will ultimately choose careers in primary care, an umbrella term that covers internal medicine, family medicine and pediatrics. But every student gains a clear understanding of primary care. “As medicine moves toward a team-based model of care,

Stepping up to quarterback



During the Primary Care Clerkship at Cambridge Health Alliance, Kat Wakeham (far right) follows patients’ progress through weekly sessions with mentor David Hirsh (center).



it's important for all students—whether they become medical specialists or surgeons—to understand how the pieces fit together,” Cunningham says.

That understanding crystallized student Kat Wakeham's decision to join the advisory board for the planned primary care center and to pursue a career in family medicine. “Medical care is collaborative; it can't be done by one person,” she says. “I see myself as the quarterback, the person who integrates the whole picture of a patient.”

Wakeham follows numerous patients in her PCC at Cambridge Health Alliance. After following an elderly patient for a month, she was able to observe his stroke medication's negative effects and suggest a change. “Forming relationships with patients over time,” Wakeham says, “allows you to think about the complexities and many variables involved in their care.”

The PCC is equally empowering for its preceptors. “My patients tell me, ‘You're a better doctor when your student is around,’” says Wakeham's primary care physician-mentor, David Hirsh, who has taught PCC students for 14 years. Hirsh strives to convey the satisfaction that comes from forging lasting relationships with patients. “Students come to realize the complexity and intellectual rigor that comes with being the central caregiver,” he says. “You get to engage in the full symphony of a patient's life. As a physician, what more could you want?”

Hirsh sees the HMS Center for Primary Care as a means to raise the profile of the profession and to explore reforms in care delivery and physician compensation. “When Harvard Medical School says, ‘We're on this team to repair a fractured health care system,’” Hirsh says, “those words matter—and the world listens and follows suit. I think that the collective work of great thinkers will lead us toward a more patient-centered and effective system of care.” ☺



Through an innovative eight-month clerkship, every HMS student gains a clear understanding of primary care. A new \$30 million center aims to rehabilitate the field through leadership in research and education.



DURING HER THIRD-YEAR ROTATION at Massachusetts General Hospital, Belinda Waltman bonded with a woman with an acute form of leukemia. Even after her rotation in medicine ended, Waltman asked residents to page her when the patient was readmitted, and she was at the woman's side as she lay dying. "It was very difficult to watch her succumb despite the best available treatments," says Waltman, who expects to earn her MD in 2011.

Waltman says she was unsettled by the stark contrast between her patient's fate and that of others with a different form of leukemia who were discharged quickly, armed with a targeted therapy in pill form. The disparity played a part in her decision to interrupt her clinical studies to do research on targeted cancer therapies, an opportunity afforded by a Doris Duke Charitable Foundation fellowship.

Nearly half of Waltman's class will spend more than four years pursuing the MD degree; many will take an extra year to do research. Beginning with the Class of 2015, all MD students will get a taste of what it's like not only to acquire knowledge, but also to create it. Through the new Scholars in Medicine program, directed by HMS alumnus and Professor of Medicine Gordon "Buck" Strewler, each student will complete a scholarly project. Some will do so in a lab, while others will participate in patient-oriented investigation or pursue projects in areas such as the social sciences, health policy, global medicine or community health.

"It's wonderful to be in a supportive environment that encourages you to advance the practice of medicine by thinking broadly and delving deeply into a disease process," Waltman says. Under mentors Lecia Sequist and Jeff Engelman, both assistant professors of medicine and oncologists at the Massachusetts General Hospital Cancer Center, she studied genetic mutations that make some lung cancers responsive to targeted drugs, such as erlotinib. Using a genetic screening assay called SNaPshot,

Becoming a scientist and scholar

Beginning with the Class of 2015, all MD students will get a taste of what it's like not only to acquire knowledge, but also to create it through the new Scholars in Medicine program.



Belinda Waltman is helping researchers at Massachusetts General Hospital identify genetic changes that occur in lung cancer and potential new drugs to combat the disease.



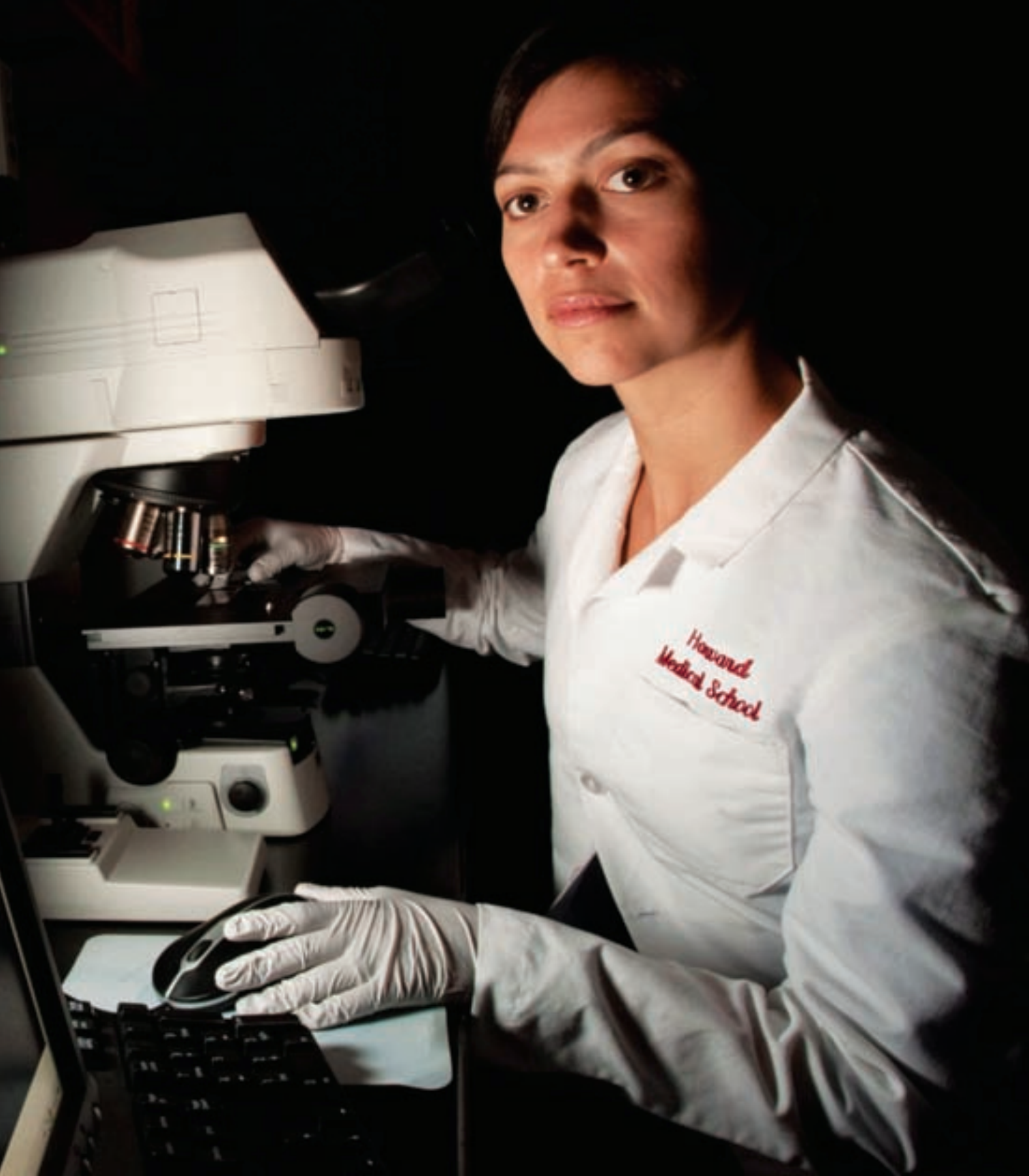
Waltman explored additional genetic changes seen in cancers that recur, with a goal of identifying drugs that can stay one step ahead of the disease.

Mass General is one of a few U.S. hospitals that now screen all lung cancers for common mutations. “We’re starting to categorize cancers at the level of genes and to say to our patients, ‘Your cancer tells us this is the right treatment for you,’” Sequist explains. Waltman lights up when talking about their findings, which are under review for publication. Genetic mutations identified by the assay already have spurred changes in some patients’ treatment regimens, she says.

Translational research—work that moves laboratory findings into the realm of patient care—is tough to do. “People talk a lot about bench-to-bedside research, but in practice, it’s difficult to bridge that gap,” Waltman says.

In a second project conducted by the lab of Daniel Haber, the Kurt J. Isselbacher/Peter D. Schwartz Professor of Oncology at HMS and director of the Mass General Hospital Cancer Center, Waltman helped develop a histopathologic staining process to increase the diagnostic capabilities of the second-generation circulating tumor cell chip, a device that can probe a patient’s disease based on tumor cells extracted from blood. A related paper on an enhanced version of this chip has been accepted for publication. “Most doctors don’t get the chance to perform research until after medical school, typically through a fellowship,” says Waltman. “I feel fortunate to have had this exposure so early in my training.”

Back at the hospital for her last year at HMS, Waltman says she is “thinking more deeply, using my critical analysis skills more” as she works up a patient from scratch and arrives at a diagnosis. While some patients will have only a short time to live, Waltman draws hope and “a sense of confidence,” she says, “from knowing that researchers like those I worked with during the research year will make big differences in the long term.” 🌀



Instructor in Neurology Edison
Miyawaki teaches "Human Nervous
System and Behavior."

Harvard Medical School's
academic programs are
crucibles of learning for
the world's brightest minds
in biomedicine.



ACADEMIC PROGRAMS

MEDICAL EDUCATION: CONTINUOUS QUALITY IMPROVEMENT

While HMS has marked milestones in medical education reform (see pages 8-17), curriculum reform is ongoing—a process of evaluation, innovation and reevaluation—under Dean for Medical Education Jules Dienstag and other Program in Medical Education leaders. Just as objectives for curriculum reform come into view, new challenges demand attention. One task force has been appointed to formulate a novel course sequence for years I and II that integrates the teaching of communication and clinical skills. Another is working on reengineering classroom teaching and revitalizing tutorials to make them more interactive, and to foster critical thinking and analytic reasoning.

MILESTONES IN GRADUATE EDUCATION

Flying Colors for PhD Programs. In October, each of four PhD programs in the HMS Division of Medical Sciences, led by David Golan, HMS dean for graduate education, and David Cardozo, HMS associate dean for basic graduate studies, received top rankings from the National Research Council in a survey of nearly 5,000 programs at 212 schools. The Biological and Biomedical Sciences program, which recently added two tracks—Cancer Biology, and Genetics and Genomics—took spots 1 or 2 in a comprehensive array of metrics in a field of 122 cell and developmental biology programs; Immunology ranked 6 and higher among 78 programs; Neuroscience was 1 or 2 among 94 programs; and Virology earned rankings between 1 and 4 among 74 microbiology programs.

Leder Program. Receiving high marks from an external review committee was the Leder Human Biology and Translational Medicine Program, which creates enrichment opportunities for basic science students desiring familiarity with the medical sciences and the culture of clinical medicine.

Program in Graduate Education. To better coordinate graduate curricula, faculty development, student affairs and diversity initiatives, HMS formalized the Program in Graduate Education, bringing together directors of the nine life science PhD programs in the Longwood medical area, including seven on the HMS Quad.

Curriculum Fellows Program. In 2010, HMS officially launched the Curriculum Fellows Program, which prepares educators to train tomorrow's biomedical PhDs. Through this initiative, directed by David Van Vactor, HMS professor of cell biology and head of the Biological and Biomedical Sciences graduate program, postgraduate fellows are improving the quality and breadth of PhD coursework. They are creating innovative course formats and web-based learning-assessment tools while training for careers in biomedical science education.

FRESH IDEAS FROM HARVARD CATALYST

Harvard Catalyst, the Harvard Clinical and Translational Science Center, strives to improve human health by enabling collaboration, and by providing tools and training to investigators who aim to translate basic discoveries into patient therapies. Harvard Catalyst engages Harvard's 10 schools, 17 affiliates,




In 2010, medical students came to HMS from 32 U.S. states, Puerto Rico, Guam and 10 foreign countries.

Massachusetts Institute of Technology, the Boston College School of Nursing, Harvard Pilgrim Health Care and other partners. Highlights include:

- During the five-day course titled "Introduction to Clinical Investigation," participants learned about Pathfinder, a new resource tool that outlines ideas and opportunities for engagement along a four-level spectrum of translational research. The course, attended by 300 basic and clinical postgraduate fellows and junior faculty, was led by Elliott Antman, HMS professor of medicine at Brigham and Women's Hospital, and James Ware, the Frederick Mosteller Professor of Biostatistics at the Harvard School of Public Health.



 A computer-driven patient simulator in the Tosteson Medical Education Center challenges students to make rapid diagnoses.

- More than 50 basic and clinical scientists enrolled in a new course, “Intensive Training in Translational Medicine,” with director Anthony Hollenberg, HMS associate professor of medicine at Beth Israel Deaconess Medical Center, describing how to conduct proof-of-concept human clinical studies.
- A new website enables HMS faculty and fellows to register for a slate of career-building courses, workshops and seminars known as the Advanced Curriculum Compendium. Overseeing the compendium are program director Eric Rosenberg, HMS

associate professor of medicine at Massachusetts General Hospital, and his colleagues.

- KL2 Medical Research Investigator Training (MeRIT) awards again provided two years of salary and senior mentorship to eight investigators for disease-specific research projects.
- A new program, the C3 Bioinformatics Initiative, sponsored by Harvard Catalyst and the HMS Center for Biomedical Informatics at the Countway Library of Medicine, introduced eight workshops on the use of bioinformatics tools to analyze genomic data.

MASTER OF MEDICAL SCIENCE IN BIOINFORMATICS

To enrich the knowledge base of physicians, scientists and trainees concurrently pursuing an MD or PhD, HMS formalized the criteria for Master of Medical Science degree programs in July. The first new program, in bioinformatics, is headed by Alexa McCray, HMS associate professor of medicine and co-director of the Center for Biomedical Informatics at the Countway Library of Medicine. Master’s programs under development will emphasize translational science.

STRATEGIC THRUSTS IN GLOBAL MEDICINE

Scholarship and training focused on health systems in Haiti, Peru, Rwanda, Malawi and elsewhere are rooted in the HMS Department of Global Health and Social Medicine. The department is chaired by Paul Farmer, who in December 2010 was honored with the first Kolokotronis University Professorship in Global Health and Social Medicine. In collaboration with key institutional partners, including the Division of Global Health Equity at Brigham and Women’s Hospital and Partners In Health, the department trains students,

clinicians and researchers to improve health care delivery in resource-poor settings while addressing political, economic and social challenges through the integration of research, teaching and service. Introduced this year were the Programs in Global Health and Social Change, comprising initiatives in areas such as mental health, focusing on closing the service gap in treating depression and other disorders; newborn health, striving to save the nearly four million babies worldwide who die before 1 month of age from readily treatable conditions; and surgical care, working in regions such as the Americas, Africa and the Caribbean to reduce millions of fatalities and debilitating conditions that could be prevented with proper surgical care.

HMS-PORTUGAL PROGRAM SPANS ATLANTIC

The HMS-Portugal Program in Translational Research and Information, which forges collaborations between



Harvard and Portuguese biomedical research institutions, held its second symposium and seven workshops with HMS faculty participation and also awarded its first round of collaborative grants in 2010, each \$160,000. A team aiming to develop new drugs to eradicate malaria comprises scientists from the HMS Department of Biological Chemistry and Molecular Pharmacology, the University of Lisbon, the Gulbenkian Institute of Science and the Instituto de Medicina Molecular. Working to reduce newborn mortality by more effectively predicting intrapartum fetal complications are researchers from HMS and Beth Israel Deaconess Medical Center, the University of Porto and the Instituto Superior Técnico, Lisbon. Studying the evolution of esophageal cancer is a third group uniting expertise at Dana-Farber Cancer Institute, the Gulbenkian Institute and the Instituto Português de Oncologia de Lisboa Francisco Gentil.

DUBAI CONFERENCE TACKLES INHERITED MUTATIONS

The annual Partners in Research conference sponsored annually by the Dubai Harvard Foundation for Medical Research (DHFMR) convenes academic leaders and young investigators throughout the United Arab Emirates, Arabian Gulf and broader Middle East. A primary focus is genetics, as many diseases prevalent in the region involve inherited mutations affecting the brain, heart, lungs and immune system. In November 2009, Barbara McNeil, the Ridley Watts Professor of Health Care Policy at HMS and chair of the Department of Health Care Policy, discussed the complexity of translating basic advances into clinical care. Middle East-based scientists whose collaboration with HMS researchers is supported by DHFMR also presented work, including a study at the Al-Sabah Pediatric Hospital in Kuwait of more than 100 disorders arising from mutations that undermine immune defenses, a study at American University of Beirut of genetic mechanisms involved in Batten disease, and studies of autism and other cognitive deficiencies.

CONTINUING MEDICAL EDUCATION ENCIRCLES THE GLOBE

The HMS Department of Continuing Education strives to be not only the best in the world, but also the best for the world, by emphasizing four Rs: *rigor*—the highest standards of evidence-based teaching and innovation; *reputation*—enhancing HMS's reputation; *reach*—making offerings accessible and affordable; and *research*—ensuring teaching methods help attendees retain new knowledge and incorporate it into practice.



Left and above: The backbone of the second-year curriculum is the Patient-Doctor II course, which includes hands-on instruction in conducting a physical examination.



More than 70,000 physicians took advantage of over 700 courses and in-hospital conferences offered at HMS, affiliated hospitals and six partnering medical schools. Sixty courses were offered online. In a pilot study to assess the effectiveness of supplementing live CME courses with online instruction, 91 percent of participants agreed that the online program reinforced their subject-area knowledge; 81 percent reported increased confidence in managing patients. ☼



Nick Stroustrup, a Systems Biology graduate student in the laboratory of Walter Fontana, uses scanners to monitor activity levels of the worm *C. elegans* in studies of genetics and aging.

From laboratories at Harvard Medical School to its affiliated hospitals and clinics, researchers are bridging the gap between petri dish and patient.

RESEARCH AND DISCOVERY

NON-GENETIC ROUTE TO CANCER

The idea that cancer results when detrimental mutations disturb the functioning of a cell's genes must now share the stage with a new theory—one that relies on the expression of epigenetic factors, or inherited features that influence a cell's activity but are not encoded in the DNA. According to a study reported Nov. 13, 2009, in *Cell* and led by Kevin Struhl, the David Wesley Gaiser Professor of Biological Chemistry and Molecular Pharmacology at HMS, even temporarily activating the Src oncoprotein, which helps synthesize and control tumor-promoting proteins, creates a chronic inflammatory condition that can turn non-tumor-forming human breast cells cancerous for several generations, even after the original stimulus is removed. Struhl and colleagues uncovered this mechanism in non-breast cancer cell lines and found hints of it in other cancerous tissues as well.

NEW HOPE FOR SPINAL CORD INJURY

In spinal cord injury, scar formation is a mixed blessing. To prevent the injury from spreading beyond damaged tissue, scar-forming cells release potent chondroitin sulfate proteoglycans (CSPGs). Unfortunately, these molecules also block the regeneration of nerve fibers. HMS researchers have identified a receptor on the surface of neurons to which CSPG molecules bind, exposing a potential therapeutic target. A team led by John Flanagan, HMS professor of cell biology, with colleagues at Case Western Reserve University, reported this finding in *Science* on Oct. 23, 2009. While the slippery sugar coating on CSPGs prevents most receptors from latching on, the researchers identified special receptors capable of binding

to the coating. Ultimately, their discovery could contribute to nerve-regenerating treatments for spinal cord or brain injury and for neurodegenerative diseases, such as Alzheimer's and Parkinson's disease.

FLU-FIGHTING SQUAD FOUND IN HUMAN CELLS

HMS scientists have uncovered the human body's first line of defense against the flu virus: a family of antiviral agents that occur naturally in every cell. These proteins—known as interferon-inducible transmembrane proteins—act early to prevent or slow most virus particles from infecting cells. They go to work after the particles attach to the cells, but before they can deliver their pathogenic cargo. This discovery, published Dec. 17, 2009, online in *Cell*, may lead to improved prevention and treatment of influenza and other viral infections, according to study author Abraham Brass. Brass began his research as a postdoctoral fellow under Stephen Elledge, the Gregor Mendel Professor of Genetics and of Medicine at HMS and Brigham and Women's Hospital. Brass is now an HMS instructor in medicine at the Ragon Institute of Massachusetts General Hospital, MIT and Harvard.

IMPACT OF GLOBAL HEALTH AID

Low-income countries have doubled their domestic public spending on health, and international aid has helped to increase this spending, according to an analysis of 12 years of data by Chunling Lu, HMS assistant professor of social medicine, working with colleagues at the Institute



A custom fluidic system maintains bacteria being challenged by drug treatments.

for Health Metrics and Evaluation at the University of Washington. Government health-spending increases were greater among countries in which nongovernmental organizations receive and distribute more aid. In some areas, particularly countries in sub-Saharan Africa, foreign aid given directly to governments tends to partially replace domestic spending on health rather than fully supplement it. Lu says both trends warrant further investigation. The study, published April 17, 2010, in *The Lancet*, is the first systematic exploration of how money donated for global health is used. According to Lu, the findings are expected to influence policy and research.

AGGRESSIVE END-OF-LIFE CARE NOT UNIVERSAL

Noting a paucity of studies assessing aggressive care for end-of-life patients, HMS researchers compared approaches provided to older male patients receiving treatment for metastatic lung or colorectal cancer through either the Veterans Health Administration (VHA) or Medicare's fee-for-service system. In the Aug. 1, 2010, issue of *Cancer*, Nancy Keating, an associate professor in the HMS Department of Health Care Policy and associate professor of medicine and physician in the Division of General Internal Medicine at Brigham and Women's Hospital, reported that VHA patients were less likely to receive chemotherapy in the last two weeks of life or to be sent to an emergency department or intensive care unit in the last month. Keating speculates the differences may be linked to factors such as the VHA's budget consciousness or capacity to respond to a patient's wish to limit potentially futile care.

ANTICOAGULANTS PROVIDE TUBERCULOSIS CLUE

Highlighting a possible new approach to antibiotic therapy, researchers have discovered that warfarin and related anticoagulants can interfere with tuberculosis (TB). This pathway involves the forging of disulfide bonds, the same mechanism by which bacterial toxins are locked into destructive form. Jonathan Beckwith, the American Cancer Society Professor of Microbiology and Molecular Genetics at HMS, previously identified two components of this bond-making pathway. In this study, published in the Jan. 5, 2010, issue of *Proceedings of the National Academy of Sciences*, Beckwith's team looked for additional bond-making pathways. They focused on an enzyme, VKOR, through which the liver makes clotting factors—the pathway thwarted by anticoagulants. They found that bacterial VKOR is similar to human VKOR; that TB and other bacteria rely on this enzyme to make

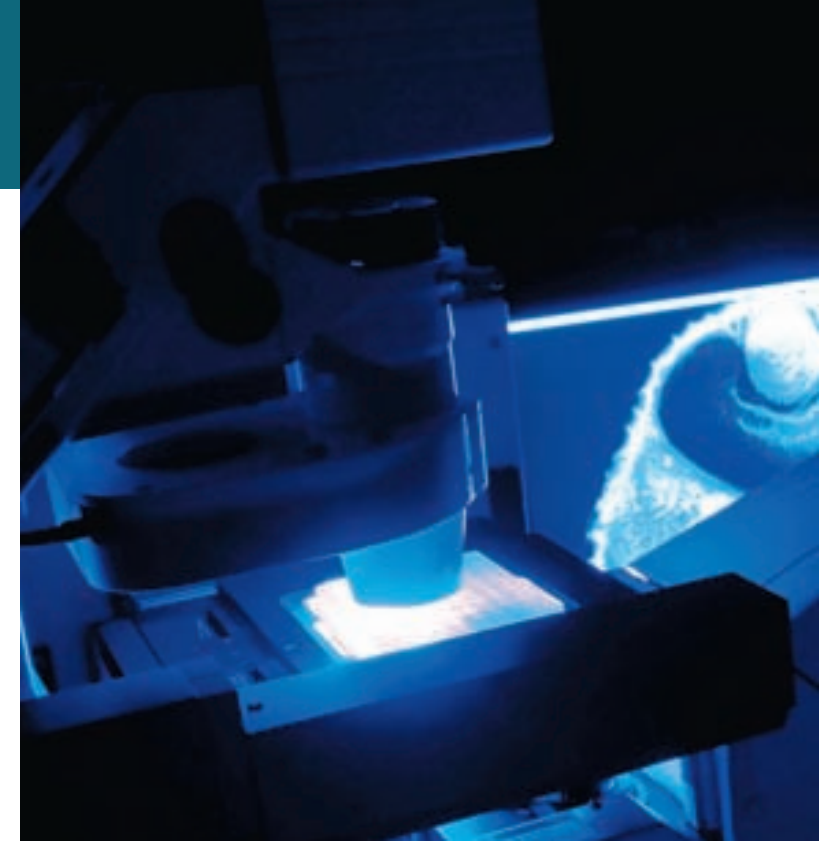
disulfide bonds; and that warfarin at high doses inhibits VKOR activity in the TB bacterium, weakening its toxicity.

ENZYME LOSS TIED TO ANGELMAN SYNDROME

For more than a decade, researchers have known that a single gene mutation causes Angelman syndrome, a childhood developmental disorder marked by mental retardation, lack of speech, seizures and autism-like behaviors. But no one could explain how. New work from Michael Greenberg, chair of the HMS Department of Neurobiology, has uncovered the role of the enzyme Ube3A and what might occur if it is lacking at the start of development. In the first few years of life, brain activity is "rewired" by external stimuli, a process critical to normal neurologic function. Without Ube3A, the brain loses the ability to fine-tune neuronal circuits, which could explain the devastating deficits of Angelman syndrome. The study, published March 5, 2010, in *Cell*, ties the loss of Ube3A to a specific change in synaptic function and identifies proteins that Ube3A normally regulates, suggesting new targets for treating the syndrome.

LYMPH CELLS DEFEND THE NERVOUS SYSTEM

Researchers have identified a crucial duty for lymph node cells known as subcapsular sinus (SCS) macrophages: to prevent lymph-borne viruses from infecting the mammalian central nervous system. Viruses cordoned off within these nodes can infect peripheral nerves and use the nerves as conduits to the central nervous system. A team led by Ulrich von Andrian, the Edward Mallinckrodt Jr. Professor of Immunopathology in the HMS Department of Pathology, explored why such viruses do not escape from the nodes more often. Focusing on a virus related to rabies, the team found that SCS macrophages, together with type 1 interferons produced by lymph-node cells,



kept the virus from infecting peripheral nerves. The findings, published June 24, 2010, in *Nature*, could inform research aimed at controlling rabies and West Nile disease.

OBESITY PREVENTION SHOULD BEGIN EARLY

Efforts to prevent childhood obesity should begin far earlier than previously thought—even before birth—and should target risk factors that disproportionately affect minority children. In a study published April 4, 2010, in *Pediatrics*, researchers tracked mother-child pairs from pregnancy through the child's fifth year. Led by Elsie Taveras, an HMS assistant professor of population medicine at the Harvard Pilgrim Health Care Institute and of pediatrics at Children's Hospital Boston, the study found this period critical for preventing childhood obesity. Before age 2, almost every risk factor, such as a mother's excess weight or gestational diabetes, was higher in minorities than in Caucasians. These children were more



likely to be born small and to gain excess weight. Many risk factors remain understudied, the researchers say.

ERASING A STEM CELL'S HISTORY

Even cells have memories. A research team led by Konrad Hochedlinger, HMS assistant professor of medicine at Massachusetts General Hospital and associate professor in the Harvard Department of Stem Cell and Regenerative Biology, has found that although researchers can run the histories of mature specialized cells backward until the cells resemble embryonic stem cells, this reprogramming does not completely erase cell memory. Moreover, that memory can restrict what a cell can become, a potential obstacle to scientists who value reprogrammed cells for their potential to become any type of cell in the body. Hochedlinger's team found they could erase this memory—or control how much of it remained—by splitting cells lines repeatedly and growing new

generations of the cells. The study appeared July 19, 2010, online in *Nature Biotechnology*.

WHY SOME DRUG COMBINATIONS BACKFIRE

For infections, combination drug therapy sometimes works well. For example, one drug may break down a pathogen's protective barrier, while another delivers the deathblow. But some combinations are ineffective, even counterproductive. In a study published Nov. 13, 2009, in *Cell*, Roy Kishony, HMS associate professor of systems biology, and colleagues at Stanford University showed how antibiotic drugs can influence levels of gene expression in bacterial cells. Some drug cocktails actually put the bacteria in a better genetic position to survive, thereby undermining the drugs' effectiveness. Using a systems approach—examining how a cell's pathways and moving parts behave as a whole—may point to new ways of interpreting data and understanding the consequences of formulating antibiotic combinations in the race against resistant pathogens.

ENZYME BOOSTS PROSPECTS FOR OSTEOARTHRITIS PREVENTION

A research team led by Yefu Li, assistant professor of developmental biology at the Harvard School of Dental Medicine, is studying osteoarthritis at its earliest stages, when intervention would have the greatest impact. Previous research into this crippling bone-and-joint disorder has focused on late-stage disease to relieve pain and increase mobility; however, joint damage can begin several decades before symptoms arise. Using molecular and genetic tools, the team has found that cartilage cells respond to altered mechanical stress by activating an enzyme called HtrA1, which triggers the serial molecular events that make a normal joint osteoarthritic. Their

findings, published May 2010 in *Histology and Histopathology*, may lead to a drug target for HtrA1 and other proteins involved in joint degeneration.

EXTENDING LIVES IN METASTATIC MELANOMA

A disease-fighting antibody can extend the lives of patients with deadly metastatic melanoma. In a large international clinical trial—the first to show a survival benefit against advanced melanoma—F. Stephen Hodi, assistant professor of medicine at HMS and director of the Melanoma Treatment Center at Dana-Farber Cancer Institute, studied the drug ipilimumab, a monoclonal antibody made by duplicating a single type of human antibody. Findings published Aug. 19, 2010, in the *New England Journal of Medicine* showed that patients given ipilimumab survived for 10 months, on average, compared with six months for the control group, a 67 percent increase in survival. These results demonstrate the promise of monoclonal antibody treatment for patients who do not respond to conventional therapies.

UNCOVERING A NEW ROLE FOR RNA

Scientists have discovered a role for messenger RNA (mRNA) beyond its well-known function of coding for proteins. In a study led by Pier Paolo Pandolfi, the George C. Reisman Professor of Medicine at HMS and Beth Israel Deaconess Medical Center, researchers found that mRNAs, along with noncoding RNAs and mysterious “genetic relics” called pseudogenes, regulate gene expression at large by altering the function of small RNA molecules called microRNAs. Their loss or aberrant expression can have consequences for cancer and other diseases. These findings, reported June 24, 2010, in *Nature*, may lead to the identification of new disease-related genes, improving diagnosis and therapy. ☼

A painting in the Countway Library of Medicine heralds "The First Successful Kidney Transplant," performed in 1954 at the Peter Bent Brigham Hospital, a Brigham and Women's Hospital forerunner.



Outstanding HMS faculty members are role models for students, who in turn energize and inspire their mentors.

PEOPLE

Quad Leadership Appointments

NEW DEAN TO OVERSEE BIOMEDICAL RESEARCH

In May 2010, William Chin assumed the role of executive dean for research, a new post created by HMS Dean Jeffrey S. Flier with overarching responsibility for biomedical research at the School, where Chin is also the first incumbent of the Bertarelli Professorship in Translational Medical Science. A former president of the Harvard Medical Alumni Association, Chin spent the first 25 years of his career at Joslin Diabetes Center as well as at Brigham and Women’s Hospital, where he was chief of the Genetics Division and a Howard Hughes Medical Institute investigator.

Chin served Eli Lilly and Company for a decade, most recently as vice president for discovery research and clinical investigation. Today, working with leaders at Harvard University, HMS and its affiliates, Chin is implementing a strategic vision for research that unites disciplines and institutions in a common goal: to translate laboratory discoveries into potent therapies that advance human health.

TOP ADMINISTRATIVE LEADER NAMED EXECUTIVE DEAN

Launching the search for a new executive dean for administration, HMS Dean Jeffrey S. Flier sought an able leader to implement the School’s strategic plan, forge tighter collaborative relationships with other schools at Harvard and affiliated hospitals and institutes, and oversee communications, finance, human resources, information technology, and operations and facilities.

That search began and ended in July 2010 with the appointment of Richard G. Mills, interim executive dean, to the position.

Mills came to HMS in 2005 as associate dean for planning and facilities. After assuming an expanded role as dean for operations and business affairs, he was promoted to dean for education and global program administration, overseeing global programs, programs in medical education and graduate education, the Countway Library of Medicine, the Center for Biomedical Informatics, the Department of Continuing Education and Harvard Health Publications. Previously, Mills served as a litigation attorney, a principal in strategic consulting and a senior staff counsel for the Massachusetts Water Resources Authority.

FOSTERING EXCELLENCE IS GOAL OF FACULTY AFFAIRS DEAN

A 17-year veteran of HMS, Maureen Connelly was named dean for faculty affairs in July 2010, having served since 2005 as assistant, associate and interim dean. Connelly is responsible for fostering an academic culture that enhances each faculty member’s ability to excel. Her priorities include streamlining and expediting the promotion process and building a more diverse faculty in concert with School-affiliated hospitals and the HMS Office for Diversity and Community Partnership. Connelly joined Harvard as a general internal medicine fellow at Brigham and Women’s Hospital. With a master’s degree in clinical effectiveness from the Harvard School of Public Health, she joined the HMS Department of Population Medicine, where she led research on patient decision-making regarding menopause and osteoporosis. For 10



Left to right: William Chin, executive dean for research; Richard G. Mills, executive dean for administration; Maureen Connelly, dean for faculty affairs.

years she practiced primary care and women’s health at Harvard Vanguard Medical Associates. Work on a junior faculty survey for the HMS/HSDM Joint Committee on the Status of Women sparked her interest in helping faculty attain their professional and personal goals.

FIVE JOIN BOARD OF FELLOWS

As advisers to HMS leaders, Board of Fellows members bring intelligence, creative thinking and commitment to their role. Five new members were appointed in 2010.

Bevin Kaplan, senior director of the Warren Alpert Foundation, has played a leading role in managing the prestigious Warren Alpert Foundation Prize, presented annually following a scientific symposium honoring the recipient and hosted at HMS. Bill Helman, a partner at Greylock Partners, is a strategic adviser to Paul Farmer, chair of the HMS Department of Global Health and Social Medicine; with former U.S. Senator William Frist, he co-chairs the department’s advisory council. Freda Lewis-Hall, chief medical officer and senior vice president of Pfizer, brings to HMS deep expertise in the pharmaceutical and health



Howard Green, stem cell pioneer, is the recipient of the 2010 Warren Alpert Foundation Prize.

care industries. Gwill York is managing director of Lighthouse Capital Partners and a founding member of the Systems Biology Council at HMS. Michael Rosenblatt, a former dean of Tufts Medical School, is chief medical officer for Merck Pharmaceuticals.

Honors and Awards

WARREN ALPERT FOUNDATION PRIZE HONORS STEM CELL PIONEER

Long before stem cells gained fame, Howard Green cultivated them in his laboratory, generating skin grafts for burn patients in the first therapeutic use of cultured cells. In September, Green, the George Higginson Professor of Cell Biology at HMS, received the 2010 Warren Alpert Foundation Prize, joining an elite international group of researchers, seven of whom have also won the Nobel Prize. At a symposium in his honor, prominent stem cell researchers outlined the promise and the obstacles facing stem cell therapies.

It was in 1983 that Boston Shriners Burn Hospital surgeons used Green's cultured skin grafts to save two severely burned children. Today, companies in the United States, Japan and Korea use Green's technique to grow epidermis grafts for thousands of patients. Researchers have also extended his findings to grow corneal stem cells and to restore sight to eyes damaged by chemical burns.

The Warren Alpert Foundation supports groundbreaking studies, scholarship and service. Its annual \$200,000 prize recognizes researchers for laboratory discoveries that have been translated into therapies or hold real promise for improving human health. Prize recipients are chosen by the foundation's scientific advisory board, which is chaired by HMS Dean Jeffrey S. Flier.

CANCER BIOLOGIST EARNS GAIRDNER INTERNATIONAL AWARD

The Gairdner Foundation named William Kaelin, HMS professor of medicine at Dana-Farber Cancer Institute, a recipient of the 2010 Canada Gairdner International Award, among the most prestigious of all medical research prizes. Working independently, Kaelin and co-recipients Gregg Semenza of Johns Hopkins University and Peter Ratcliffe of the University of Oxford identified molecular mechanisms that enable cells to detect and respond to an oxygen shortage by making new red blood cells and blood vessels. Kaelin's explorations of tumor suppressor genes and the rare von Hippel-Lindau syndrome illuminate potential routes for developing drugs for anemia, heart attack, stroke and cancer.



NINE APPOINTED TO INSTITUTE OF MEDICINE

Nine HMS faculty members were among the 65 appointees to the Institute of Medicine in 2010, the health

arm of the National Academy of Sciences. The nonprofit IOM advises U.S. decision-makers and the public on pivotal health care and health policy issues.



David Altshuler, a professor of genetics and of medicine at Massachusetts General Hospital and a founding member of the Broad Institute, studies human genetic variation and its application to disease. He has been a lead investigator for such international

collaborations as the SNP Consortium, the International HapMap Project and the 1,000 Genomes Project.

Kenneth Anderson, the Kraft Family Professor of Medicine at Dana-Farber Cancer Institute, explores biologically based therapies for multiple myeloma. His lab uses genomics and proteomics to illuminate the disease's development, helps identify new therapeutic targets and works to improve targeted therapies.



John Ayanian, a professor of health care policy at HMS, professor of medicine at Brigham and Women's Hospital, and professor of health policy and management at the Harvard School of Public Health, investigates the effects of race, ethnicity, gender, insurance

coverage and socioeconomic characteristics on patient access to health care and clinical outcomes. He also studies the impact on health care quality of organizational characteristics and physician specialties.

Nancy Berliner, a professor of medicine at Brigham and Women's Hospital, dissects molecular pathways involved in the differentiation of white blood cells known as granulocytes. Her interests include anemia, leukemia, DNA diagnostics and the genetic regulation of blood cell production within bone marrow.



geriatric psychiatry and a leader in hospital administration, teaching, health care policy and community service. He is widely recognized for his command of issues that drive U.S. health care and for his advocacy of effective workforce development and the reduction of disparities in care.



BIOCHEMIST GARNERS WELCH AWARD IN CHEMISTRY

Christopher T. Walsh, the Hamilton Kuhn Professor of Biological Chemistry and Molecular Pharmacology at HMS, received the Welch Award in Chemistry from the Welch Foundation in recognition of research that has exerted "a significant positive influence on humankind." Walsh shared the \$300,000 prize with JoAnne Stubbe of MIT for illuminating the molecular basis of enzymes. In revealing how antibiotics work and how drug resistance develops, Walsh's lab has facilitated the development of antibiotics that circumvent resistance. His research on biosynthesis of natural-product antibiotics could one day lead to treatments for infections, tumors and autoimmune diseases. Both recipients received gold medallions from the Welch Foundation in Houston.



Michael Chernew, a professor of health care policy at HMS, explores the causes and consequences of growth in health care expenditures. Recent work explores the design and evaluation of value-based insurance packages, which minimize financial

barriers to high-value health care services while also reducing costs.



Bruce Rosen, a professor of radiology and of health sciences and technology at Massachusetts General Hospital, explores the use of functional imaging tools to solve biological and clinical problems. Hospitals worldwide use functional magnetic resonance imaging techniques developed by Rosen and colleagues to evaluate stroke, brain tumors, and dementia and other neurological disorders.

Charles Czeisler, the Frank Baldino Jr., PhD, Professor of Sleep Medicine at Brigham and Women's Hospital and director of the HMS Division of Sleep Medicine, studies the neurobiology of the human circadian pacemaker, located in an area of the brain's hypothalamus known as the suprachiasmatic nucleus. Czeisler strives to put his findings into practice in clinical medicine and occupational health.



George Thibault, the Daniel D. Federman, MD, Professor Emeritus of Medicine and Medical Education at Brigham and Women's Hospital and president of the Josiah Macy Jr. Foundation, evaluates the practices and outcomes of medical intensive care units, as well as variations in the use of cardiac technologies. Through various leadership roles, including service as the first director of The Academy at HMS, he has raised the quality of medical education and teaching.



Gary Gottlieb, a professor of psychiatry at Brigham and Women's Hospital and the president and chief executive officer of Partners HealthCare System, is an expert on

NATIONAL ACADEMY OF SCIENCES HONORS THREE AT HMS

Three from HMS were among 72 new members elected by the National Academy of Sciences, a private organization of scientists and engineers recognized for outstanding original research. Porter Anderson, an HMS lecturer on pediatrics at Children's Hospital Boston, is best known for his work that led to the development of a vaccine against *Hemophilus influenzae* type b, which causes bacterial meningitis. William Kaelin, an HMS professor of medicine at Dana-Farber Cancer Institute and a Howard Hughes

Medical Institute investigator (see Gairdner International Award, page 28), studies how tumor suppressor proteins function in order to lay a foundation for developing anticancer drugs; his interests center on the von Hippel-Lindau tumor suppressor protein pVHL, the retinoblastoma tumor suppressor protein pRB and the p53-like protein p73. Kevin Struhl, the David Wesley Gaiser Professor of Biological Chemistry and Molecular Pharmacology at HMS, uses genetic, molecular and genomic approaches in yeast to address fundamental questions surrounding transcriptional regulatory mechanisms in cells. Using a novel microarray strategy, he investigates physiological targets of human transcriptional regulatory proteins and chromatin modifications on a whole-genome basis.

AMERICAN ACADEMY OF ARTS AND SCIENCES INDUCTS FIVE

In 2010, several HMS faculty members were inducted into the American Academy of Arts and Sciences, founded during the American Revolution. These “scholar-patriots” were recognized for their impact of their work on the nation. Harvey Cantor, the Baruj Benacerraf Professor of Pathology at HMS and Dana-Farber Cancer Institute, studies the development and function of T-cell subsets and their products. Ronald DePinho, a professor of medicine (genetics) at Brigham and Women’s Hospital and Dana-Farber, focuses on cancer-senescence pathways in normal and neoplastic processes. Carol Nadelson, a professor of psychiatry at BWH, is a pioneer in women’s mental health and staunch advocate for women in medicine. Bruce Walker, a professor of medicine at Massachusetts General Hospital and a Howard Hughes Medical Institute investigator, studies the cellular immune response to human viral pathogens, particularly HIV-1 and hepatitis C virus. Fred Winston, the John Emory Andrus Professor of

Genetics at HMS, investigates the regulation of eukaryotic gene expression in yeast at the level of transcription and chromatin structure.

OBAMA TAPS HMS EXPERTS ON BIOETHICS, HEALTH QUALITY



Two HMS leaders were tapped in 2010 for key leadership roles in science and health care by President Barack Obama, joining several other HMS faculty and alumni:

Donald Berwick, a clinical professor of pediatrics and of health care policy, was appointed chief of the Centers

for Medicare and Medicaid Services. The president and CEO of the Institute for Healthcare Improvement, Berwick is an authority on U.S. health care quality. Under President Bill Clinton, he served on the Advisory Commission on Consumer Protection and Quality in the Healthcare Industry.

Raju Kucherlapati, the Paul C. Cabot Professor of Genetics and a professor of medicine at Brigham and Women’s Hospital, was appointed to the Commission for the Study of Bioethical Issues. His laboratory is mapping and sequencing human and mouse genomes as well as disease genes, such as those involved in the Velo-Cardio-Facial/DiGeorge and Noonan



syndromes. The first scientific director of the HMS-Partners HealthCare Center for Genetics and Genomics (now the Partners HealthCare Center for Personalized Genetic Medicine), Kucherlapati is also a member of the National Advisory Council for Human Genome Research, the National Cancer Institute Mouse Models for Human Cancer Consortium and the NIH Cancer Genome Atlas project.

PRITZKER LECTURESHIP HONORS BIOMEDICAL ENGINEER

Donald Ingber, founding director of the Wyss Institute for Biologically Inspired Engineering at Harvard University, received the Biomedical Engineering Society’s Pritzker Distinguished Lectureship for 2009. The Wyss Institute,



named for philanthropist and entrepreneur Hansjörg Wyss, draws on nature’s create principles to design new biomaterials and devices. Ingber is the Judah Folkman Professor of Vascular Biology at HMS and Children’s Hospital Boston, and a professor of bioengineering at the Harvard School of Engineering and Applied Sciences.

Also in 2010, Ingber received the 2010 Rous-Whipple Award from the American Society of Investigative Pathology. Ingber explores mechanisms of cell and developmental regulation, particularly the control of new blood vessel growth, driven by the hypothesis that tissue construction is regulated mechanically.

Students

Students are admitted to Harvard Medical School's medical and science education programs not simply because they are brilliant, but also because they have leadership potential—the drive to reshape their chosen fields. The six students profiled here are unique, yet representative of the general excellence, ambition and idealism of their peers.

Financial aid enables exceptional men and women to come to HMS from all over the world, no matter their socioeconomic backgrounds. Nonetheless, debt weighs upon many new graduates. In 2009–2010, more than one-third of MD students benefited from the \$3-million-per-year Middle-Income Initiative launched by HMS Dean Jeffrey S. Flier to supplement available scholarships. To ensure that HMS remains truly accessible to qualified applicants, however, the School depends upon philanthropic organizations, alumni and friends.

KENNETH RICHARD LEE BERNARD

*MD, MBA 2011
Castle Society*

Blending Medicine and Business

The fast track has appealed to Kenneth Richard Lee Bernard ever since his high-school football days as a star running back. After earning a BS at Yale, he cranked up the speed. He's now in the final year of a joint degree program at HMS and Harvard Business School, where within five years he will have earned an MD/MBA.



Bernard's every step has been influenced by his mother, grandmother and Ojibwa heritage. His mother went to college and medical school after Bernard, her first child, was born, and today she is a family practitioner with the Indian Health Service. Her mother was a lawyer and chief justice for the tribal court system.

"My Harvard workload pales in comparison to their perseverance and sacrifices," he says. "I can only hope to play such an exemplary role."

The Native American community has cheered Bernard on, awarding him scholarships and fellowships for graduate study. In return, Bernard served as president of the Native American Health Organization and is involved in the Harvard University Native American Program. He also took a turn coordinating the Four Directions Summer Research Program, which places Native American college and graduate students in Harvard's laboratories.

With his MBA studies largely behind him, Bernard is on track for his MD in 2011. Tugging him in two directions are primary care and emergency medicine. Regardless of his choice of specialty, he says, he expects to follow in his family's footsteps by incorporating his business training into medical care for Native Americans.

"Physicians need to understand the art of health delivery and operating systems and be able to work on teams involving aspects of finance and administration—insurance, accounting, marketing and resource allocation," Bernard says. "No longer the autonomous heroes of the hospital, they need to be engaged, adaptive, compassionate partners in delivering quality health care."

ARETHA DELIGHT DAVIS

*MD 2011
Cannon Society*

In Pursuit of Dual Desires

Wholeheartedly, and with arms outstretched—that's how those who know Aretha Delight Davis describe her approach to all aspects of life, including medicine. There is magnanimity of spirit and an abundance of energy about Davis, who in 2010 began her final year at HMS and gave birth to her first child.



Davis began studying medicine after five years of practicing law in Philadelphia. Medicine and law were "dual desires I always had," she says, and her legal work often related to health care. Sensing her lack of clinical knowledge was limiting her ability to advocate for clients, she applied to medical school.

As important to Davis as public service is family. Her parents emigrated to the United States from Guyana, where Davis took a fellowship after college, working with underserved women and children. Helping her parents navigate the last years of her father's terminal illness focused her passion.

"I want to be involved in the debate over end-of-life care," Davis says, "to give other people the chance my father had" to die in contentment, with dignity. She plans to apply for a residency in internal medicine with an emphasis on primary care, an area she views as the "first line of defense" when it comes to shaping public health policy on behalf of people who lack health care.

“I have always been willing to do things differently,” Davis says of her unconventional path. In December 2009, she married physician Angelo Volandes at an orphanage for girls in Calcutta, where the pair plans to spend working vacations. Ten years earlier, she explains, her mother-in-law had also volunteered there; the wedding celebration symbolized themes of family and service.

“My number one priority,” Davis says, “is to be true to who I am, and transparent to myself and others about what I’m about.”

LAUREL YONG-HWA LEE

MD 2012

London Society (Health Sciences & Technology)

Best of All Worlds

With a passion for solving biomedical puzzles, Laurel Yong-Hwa Lee has already been a part of three research teams. Now in year three at HMS, she is enrolled in the Harvard-MIT Health Sciences & Technology program, which combines medicine, technology and engineering. But this future physician–scientist isn’t chained to the lab bench.



As an MIT undergraduate, Lee rowed on the Charles River with the varsity women’s crew team. In 2004, she was among *Glamour* magazine’s “Top Ten College Women of the Year.” The next year, she made *USA Today*’s annual All-USA College Academic First Team.

Lee had planned to attend HMS right after MIT, where she worked in the laboratory of immunologist Herman Eisen. Instead, she took a detour—to Oxford University, as a Rhodes Scholar.

Lee walked right into a public health crisis. In 2005, bird flu was spreading around the world, and the fatality rate based on a handful of known human cases was then approaching 50 percent. While pursuing a PhD with infectious disease and immunology experts Sir Andrew McMichael and Sarah Rowland-Jones, Lee worked on a vaccine strategy to target an influenza-specific T-cell immune response with the potential to confer broad protection against emerging virulent strains, such as H5N1 and H1N1.

In the laboratories of HMS professors Howard Weiner and Michael Moskowitz, Lee’s research focused on immune mechanisms of brain injury following stroke. A rapid inflammatory response exacerbates brain damage, Lee explains. “There is a massive migration of peripheral immune components across the blood-brain barrier. Evidence suggests that such immune responses play a crucial role in determining clinical outcomes of stroke.” Understanding these processes could speed the development of neuroprotective agents.

Lee presented her work at the 2010 annual meeting of the Federation of Clinical Immunology Societies. She is now enjoying her clinical rotations—and aiming for a career that combines research and patient care.

MICHAEL MORSE

MD, MPA 2011

Peabody Society

Bridge to Equality

“My religious tradition teaches that all humans are created in the image of God,” says Michael Morse, “and thus, they deserve to live in societies that support their well-being and health.” Morse, an Orthodox Jew and a candidate for a master’s in public administration from the Harvard Kennedy School as well as a medical degree, has turned his beliefs into action in what some might see as an unlikely place: the Palestinian territories.



Morse is the executive director of the Palestinian Medical Education Initiative (www.pmedonline.org), an apolitical nonprofit organization he founded in 2007 that partners with Palestinians to improve medical care delivery and medical education in the West Bank, Gaza and East Jerusalem. The organization currently works with physicians at Massachusetts General Hospital using Skype video technology to provide training to clinical staff at the Gaza Community Mental Health Programme, the major provider of psychiatric outpatient care and training in Gaza. Morse’s organization also meets regularly on Skype with leaders of that mental health facility to plan clinical care quality assurance initiatives and to institute research projects in conjunction with international colleagues.

Morse’s organization also has conducted needs assessments within Palestinian medical schools and implemented cooperative research and training projects with clinicians in the West Bank. He is now researching

and writing papers with Palestinian colleagues on stigma and mental health in the Palestinian territories.

Morse developed a holistic vision of disparities in medical care after college, when he worked 80-hour weeks as a pediatric mental health counselor at a public hospital in Washington, DC. “If a doctor’s job is considered as narrowly medical, she is often unable to help her patients,” he says. “But if she contends with the root causes of illness, including inequalities, that doctor can do much more.”

OBIANUJU OBI

*MD 2011
Holmes Society*

Doctoring as Destiny

The way her family tells the story, Obianuju Obi’s path was set early in life. When her father, an animal science PhD, came home one night, the young Uju (as she is known) jumped into his lap, put his stethoscope around her neck, and announced that she would become a doctor—at Harvard, no less. “I think there was at least some exaggeration on their part,” Obi says with a smile.



In truth, Obi was always sure about medical school; the question was what she’d do first. One of six children born to Nigerian immigrants, this straight-A student was a high-school and college basketball MVP and an accomplished flautist. “My rhythm was off,” she concedes. “I always wanted to go faster and faster and faster.”

That drive propelled her through Harvard College and, in 2005, into HMS, followed by a summer internship at the University of Minnesota’s Institute on Domestic Violence in the African-American Community. While interviewing victims and perpetrators, she learned that violence was “widespread, and no one really talks about it,” she says. “I was interested in the psychology behind it.” That curiosity drew her to dedicate two years to a fellowship at the Centers for Disease Control and Prevention and a master’s in public health at Johns Hopkins. Throughout that time, she studied autism and other developmental disorders among various ethnic groups.

Her investigation of how the symptoms of autism spectrum disorders and intellectual disabilities differ by race or ethnicity and socioeconomic status resulted in two first-author papers, which she presented at national conferences in 2009 and 2010. “The earlier the diagnosis, the sooner patients can get therapies that vastly improve symptoms later in life,” she says. Now, at HMS in year six, Obi is applying for residencies in child/adolescent psychiatry. It seems her family’s early predictions are coming true.

MICHAEL PODOLSKY

*MD 2011
Holmes Society*

The Right Ingredients

With a degree in biochemical sciences from Harvard behind him, Podolsky seriously considered moving to Los Angeles or New York to work as a chef—a way to indulge a taste he’d



developed one summer as a line cook. Playing guitar in jazz and rock bands were other “pleasant diversions”; a CD immortalizes a few of their favorite tunes.

But medicine tugged at Podolsky’s heart. Volunteering in the Emergency Department at Cambridge Hospital and in a neurosciences lab at Harvard while an undergraduate crystallized his fascination with the medical profession. Not that he didn’t already have two good role models. His mother, a pediatrician, and his father, a gastroenterologist, met in a physical diagnosis class at HMS. They loved their work, he says. “I found it very exciting when my dad had to run off in the middle of the night to answer a page.”

Since 2008, his first year at HMS, Podolsky has studied the immune response to diarrheal disease pathogens with Stephen Calderwood, chief of the Division of Infectious Diseases at Massachusetts General Hospital. That summer, backed by an Infectious Diseases Society of America medical scholarship and a Myer Dana and Etta Dana fellowship, Podolsky spent three weeks in Bangladesh, where cholera is endemic. The stay gave him “perspective on the severity of the problem and the urgency for more viable vaccines.”

Volunteering remains a constant. In addition to teaching English in Boston’s Chinatown, Podolsky has worked with students through the ExperiMentors Program in Cambridge and with drug users through the Boston Public Health Commission’s needle exchange initiative. Focused now on internal medicine, he hopes to fill more of patients’ unmet needs through research. “I want to use the privilege I’ve been afforded to give to others,” he says.

In Memoriam



The Harvard medical community mourned the passing of these distinguished professors between November 2009 and December 2010.

CHARLES BARLOW, *the Bronson Crothers Professor Emeritus of Neurology at Children's Hospital Boston, died on Dec. 11, 2010. He was 87.*



A leading authority in pediatric neurology, Barlow began his career at the University of Chicago, where he earned a medical degree in 1947. After doing internships in pediatrics at Johns Hopkins Hospital, in Baltimore, and at Children's Hospital Boston, he served in the U.S. Navy as a medical officer. In 1951, Barlow began a residency in neurology at the University of Chicago, where he ventured into the emerging field of pediatric neurology. By 1960, as an associate professor, he was conducting groundbreaking research into the blood-brain barrier. In 1963, Barlow was recruited to HMS as the Bronson Crothers Professor in Neurology and was named neurologist-in-chief at Children's. During his tenure he established the Harvard-Longwood Neurology Program, one of the few training programs in pediatric neurology and the only one to include adult and pediatric neurology. He also established the first research program in pediatric neurology at Children's when he founded the hospital's mental retardation research program, which he directed for 20 years.

KENNETH BAUGHMAN, *HMS professor of medicine at Brigham and Women's Hospital, died on Nov. 16, 2009. He was 63.*



Baughman, the director of Brigham and Women's Advanced Heart Disease Section in the Division of Cardiology, was known around the world for his research on myocarditis and as one of the nation's leading innovators in the treatment of heart failure. He played a key role in planning the hospital's Shapiro Cardiovascular Center, which opened in 2008. Before joining HMS in 2002, Baughman directed the Division of Cardiology at the University of Missouri School of Medicine for 10 years.

JOHN COLLINS JR., *HMS professor emeritus of surgery and former chief of cardiac surgery at Brigham and Women's Hospital, died on March 6, 2010. He was 76.*



In 1984, Collins performed the first heart transplant operation

in New England at Brigham and Women's. The transplant added 22 years to the life of the teenager who received it. Collins' work in the development of heart valve treatments helped extend the lives of many other patients. For more than three decades, Collins built a nationally recognized program in cardiac surgery at the hospital. He served as chief of cardiac surgery from 1970 to 1987, and as vice chair from 1987 until his retirement in 1999.

ROBERT OJEMANN, *HMS professor emeritus of surgery and neurosurgeon at Massachusetts General Hospital, died on March 3, 2010. He was 78.*



A world-renowned neurosurgeon, Ojemann published more than 200 papers on subjects of his clinical and research focus: brain tumors and cerebrovascular disease. He was the coauthor of several books, including *Surgical Management of Cerebrovascular Disease*, one of the first texts on the subject. Ojemann was named professor of surgery at HMS in 1979 and remained on the School's faculty, and at Massachusetts General Hospital, until his retirement in 2008.

PRISCILLA SCHAFFER, HMS professor of medicine (microbiology and molecular genetics) at Beth Israel Deaconess Medical Center, died on Nov. 18, 2009. She was 67.



An expert on herpes viruses, Schaffer cast light on the mechanisms by which the herpes simplex virus replicates and causes disease. She joined the HMS community in 1976 as an associate professor in microbiology and molecular genetics and chief of the Laboratory of Tumor Virus Genetics at Dana-Farber Cancer Institute. She was promoted to professor of microbiology and molecular genetics in 1981. In 1996, Schaffer left HMS to chair the Department of Microbiology at the University of Pennsylvania School of Medicine. In 2001 she returned to Boston as professor of medicine (microbiology and molecular genetics) and chief of the Laboratory of Molecular Virology at Beth Israel Deaconess Medical Center. In 2007, she accepted a professorship in molecular and cellular biology at the University of Arizona in Tucson.

ROBERT SMITH, HMS Class of 1938, clinical professor emeritus of anesthesia and former chief of anesthesiology at Children's Hospital Boston, died on Nov. 25, 2009. He was 96.



Recognized as the father of pediatric anesthesiology, Smith founded a fellowship program at Children's, one of the oldest in North America. At a time when anesthesia monitoring consisted primarily of visually observing the anesthetized child, he initiated physiological monitoring using the precordial stethoscope and pediatric and neonatal blood pressure cuffs (now known as Smith cuffs), initially made by hand. Smith joined the HMS community as assistant in anesthesia and went on to become the first anesthesiologist-in-chief at Children's. After retiring as clinical professor emeritus of anesthesia in 1980, Smith practiced at the Franciscan Hospital for Children in Brighton, Mass., from 1980 to 1992.

BERT VALLEE, the Paul C. Cabot Professor Emeritus of Biochemical Sciences at HMS, died on May 7, 2010. He was 90.



At the forefront in the analysis of protein structure, Vallee earned the title "father of metallobiochemistry" through his research on metals in biological systems. He established the Biophysics Research Laboratory at HMS and the Peter Bent Brigham Hospital, a forerunner of Brigham and Women's Hospital. As a consultant to the Monsanto Company, Vallee helped identify chemicals that spur the growth of new blood vessels in tumors. Vallee joined HMS as an assistant professor of medicine in

1956. After retiring in 1989, he continued to mentor faculty research as the Edgar M. Bronfman Senior Distinguished Professor from 1995 to 2008.

PAUL ZAMECNIK, HMS Class of 1936, the Collis P. Huntington Professor Emeritus of Oncologic Medicine at Massachusetts General Hospital, died on Oct. 27, 2009. He was 96.



Zamecnik joined Massachusetts General Hospital in 1942 as an instructor in medicine. His scientific career was marked by several major discoveries, recognized with a Lasker Award. His first major breakthroughs came in the 1950s as he elucidated the process by which proteins are formed, in addition to developing the first cell-free system for studying them. In 1956 Zamecnik co-discovered transfer RNA, a molecule that plays a crucial role in assembling amino acid molecules into protein chains. Two decades later, Zamecnik pioneered antisense technology, which uses short, synthetic nucleotide sequences to silence the activity of individual genes. After retiring in 1979, he continued his work at the Worcester Foundation for Biomedical Research; in 1997, Zamecnik moved his laboratory to Mass General, where he worked until weeks before his death.

Alumni News

More than 9,000 Harvard Medical School alumni are working to alleviate human suffering caused by disease. In addition to providing first-rate patient care and advancing research, HMS graduates advise presidents and shape health care policy here and abroad. To help keep alumni connected to HMS and one other, the Harvard Medical Alumni Association sponsors events by region, class and professional association. For details and alumni news and profiles, visit <http://alumni.hms.harvard.edu>.

ALUMNI DAY/REUNION

“Destination Boston” drew alumni from classes ending in 0 and 5 and their families and friends to HMS in May. Reunion events—22 in all—included a gala and cocktail reception at the Boston Harbor Hotel, a Duck Tour and a visit to Fenway Park. Symposia topics ranged from the 40-year war on cancer and relief efforts in Haiti to the “Medical Odyssey” of the Class of 1985.



David Benaron '85 and Joan Butterton '85 reconnect at their 25th reunion.



David Ramirez '00 takes in reunion activities with his son, Preston.



Neal Baer '96 (center) answers questions from Tenley Albright '61 and A.W. Karchmer '64.

DOCTORS AS STORYTELLERS

Neal Baer '96 engaged more than 150 students, alumni and friends with a talk titled “Doctors as Storytellers: Taking the Private and Making it Public.” Baer is executive producer for the NBC television series “Law & Order: Special Victims Unit.” Previously he held that role for “ER,” earning five Emmy nominations for his work.

CHICAGO ALUMNI AND FRIENDS EVENT

Co-hosted by Ellen Gordon and Joseph Messer '56 with the Harvard Club of Chicago, this event featured a panel discussion moderated by HMS Dean Jeffrey S. Flier and titled “Health Care Reform: What’s Next?” John Ayanian '86, Michael Chernen and Joseph Newhouse of the Department of Health Care Policy explored issues of cost, access and quality, even as Congress was debating historic reform legislation.



Joseph Messer '56, chair of the Harvard Medical Society of Chicago; HMS Dean Jeffrey S. Flier; and Ellen Gordon of the HMS Board of Fellows



Geri Weiner, Isaac Weiner '74, Kenneth Chin '74, and Maralyn Chin

SOUTHERN CALIFORNIA ALUMNI AND FRIENDS EVENT

HMS Dean for Clinical and Translational Research Lee Nadler '73 and colleague Larry Turka previewed plans to engage HMS clinical and translational research teams in studying disease pathogenesis, developing new diagnostics and therapies, and training translational and clinical investigators.

NATIONAL MEDICAL ASSOCIATION RECEPTION

The HMS offices for Diversity and Community Partnership and Alumni Relations hosted a reception for HMS alumni and friends during the National Medical Association Annual Conference in Washington, DC. More than 100 people—some from the DC area and some attending the conference—enjoyed quality time together. ☼

ENDOWED CHAIRS

The following Harvard Medical School faculty leaders were honored with endowed professorships that support innovative research and teaching by their incumbents in perpetuity. Endowed chairs are but one result of the robust philanthropic support received by HMS (for fiscal year 2010 fundraising highlights, see page 48).

MANTON PROFESSORSHIP TURNS A PAGE IN PEDIATRIC GENETICS

At the September 2009 celebration of the Sir Edwin and Lady Manton Professorship in Pediatrics in the field of genetics at HMS and Children's Hospital Boston, HMS Dean Jeffrey S. Flier recognized first incumbent Alan Beggs as "a wonderful member of this esteemed community." Speakers congratulated Beggs for his inspirational leadership in childhood muscle diseases and identification of genes involved in these conditions. Beggs described genetics as a toolkit for understanding how diseases can arise. The professorship was made possible by the Manton Foundation.

ZAPOL PROFESSORSHIP HELPS ANIMATE RESEARCH IN ANESTHESIA

When the Warren M. Zapol Professorship in Anesthesia at HMS and Massachusetts General Hospital was announced in October 2009, its first incumbent, Emery Brown, was described by Mass General's president, Peter Slavin, as "truly brilliant." Brown, an anesthesiologist in the hospital's Department of Anesthesia, Critical Care and Pain Medicine and director of its Neuroscience Statistics Research Lab, uses mathematical modeling and functional magnetic resonance imaging to understand the action of general anesthetics and how the brain processes information. Describing the cyclic model of research that brings basic discoveries to the bedside and clinical discoveries back to the lab, Brown foresaw "enormous opportunity" for his field. The professorship was made possible by a gift from Warren Zapol, the Reginald Jenney Professor of Anaesthesia at Mass General.

SWEET PROFESSORSHIP PUSHES BOUNDARIES OF NEUROSCIENCE

In December 2009, HMS Dean Jeffrey S. Flier introduced Robert Martuza, chief of neurosurgery at Massachusetts General Hospital and director of the Massachusetts General Brain Tumor Clinic, as the first incumbent of the William and Elizabeth Sweet Professorship in Neuroscience at Mass General and HMS. Martuza, whose clinical and research work focuses on neurologic tumors, predicted the chair would have a "profound impact on scientific knowledge and clinical care." The professorship was made possible by a gift from Elizabeth Sweet, widow of late HMS alumnus William Sweet.

SLATER FAMILY PROFESSORSHIP STRENGTHENS PSYCHIATRY

In May 2010, Maurizio Fava was appointed the first incumbent to the Slater Family Professorship in Psychiatry in the Field of Depression Studies at HMS and Massachusetts General Hospital. Fava, executive vice chair of the hospital's Department of Psychiatry and director of its Depression Clinical and Research Program, is a world leader in research on depression. "Our department," said Jerrold Rosenbaum, the Stanley Cobb Professor of Psychiatry and psychiatrist-in-chief at Mass General, "is often the court of last resort for patients failed by medicine's treatments for depression." Since 1996, the unit has earned top national ranking in *U.S. News & World Report*. Rosenbaum said, "but if Fava were the only one in our department, we would still be number one." The professorship was made possible by a gift from the Slater Foundation.

EGAN PROFESSORSHIP PROPELS TRANSITIONAL MEDICINE

A September ceremony at the Harvard Club of Boston ushered in Ellis Neufeld as the first incumbent of the Egan Family Foundation Professorship of Transitional Medicine. Citing Neufeld's clinical and laboratory investigations of pediatric blood disorders, HMS Dean Jeffrey S. Flier hailed him as a leader in a "unique field of medicine that focuses on patients' transition from childhood to adulthood." David Williams, the Leland Fikes Professor of Pediatrics at HMS, and chief of the Division of Hematology and director of Translational Research at Children's Hospital Boston, described Ellis as an outstanding researcher who "observes clinical problems and works to solve them in the laboratory." Neufeld noted that "the time is right to build this field." Three or four decades ago, children with cystic fibrosis rarely lived beyond age 12, he said, but today's treatments allow them to survive into middle age. Transitional medicine, Neufeld said, recognizes the need for a continuum of care as young people grow up to face adult health issues. This new professorship is the second at HMS sponsored by the Egan Family Foundation.

TEDLOW PROFESSORSHIP ANNOUNCED IN DEPRESSION STUDIES

Opening the September celebration of the Joyce R. Tedlow Professorship in Psychiatry in the Field of Depression Studies, Dean Jeffrey S. Flier addressed the first incumbent, Jonathan Alpert, saying, "You are not only a leader in the field, but an outstanding member of our faculty." Massachusetts General Hospital President Peter Slavin called Alpert "a stellar role model and educator." Thanking colleagues, mentors, family and friends, Alpert called the celebration "the most cherished memory of my lifetime." Looking to the future, he noted that his chair held abundant value for psychiatry and HMS because it would further research, scholarship and training in depression. The Joyce R. Tedlow Professorship was made possible by a gift from Richard Tedlow. ☺

Ronald Arky, the Daniel D. Federman, MD Professor of Medicine and Medical Education and master of the Peabody Society, with medical student Adebola Yakubu-Owolewa, who first stepped onto the HMS campus as a high-school student.

Special initiatives and pipeline programs at HMS help build a more diverse, inclusive community.



OUTREACH AND DIVERSITY

FROM PROJECT SUCCESS TO HMS

Total immersion is a learning style that suits Adebola Yakubu-Owolewa (see photo at left). When she first set foot on the HMS campus, in 2000, she was just 17 and a high-school junior, working for the summer on a population-science study involving statistical analysis. She had enrolled in Project Success, a program at the School designed to encourage talented Boston and Cambridge high-school students to consider biomedical careers.

Something clicked.

The program, sponsored by the HMS Office for Diversity and Community Partnership, linked Yakubu-Owolewa with a faculty mentor. With other curious students, she took part in life-science seminars and worked in a lab. Today, after concentrating in applied math at Harvard College, she is back at HMS as a member of the Class of 2013.

Helping people in dire need of health care is her central focus. In the summer of 2010—in Nigeria, her parents' homeland—she did an internship at an AIDS Prevention Initiative in Nigeria (APIN) clinic affiliated with the University College Hospital, in Ibadan. "I worked with medical doctors to provide solutions to pressing clinical issues relating to patient compliance, education and care," she says.

Community service has always been a priority for Yakubu-Owolewa. For three years she volunteered with the Boston Health Care for the Homeless Program, monitoring the vital signs and blood sugar levels of patients with diabetes. That experience was critical to her decision to go to medical school, she says. "I saw the effects of insufficient access to health care and wanted to change the situation."

Yakubu-Owolewa plans a career in internal medicine. Along with her obligations at HMS, she co-leads the Life with Long-term Care series, helping patients with chronic diseases share their experiences with the HMS community.

FACULTY DEVELOPMENT: ACCELERATING PROMOTIONS, VALUING DIVERSITY

In November 2010, following more than a year of engaging and rigorous discussion, the HMS Task Force on Faculty Development and Diversity delivered to Dean Jeffrey S. Flier recommendations aimed at creating a still more vibrant and diverse faculty and trainee community at HMS. Flier accepted the group's proposals and implementation plan, congratulating Nancy Tarbell, task force chair and dean for academic and clinical affairs, and a group of 60-plus faculty and staff.

"Harvard Medical School has long championed faculty development and diversity through a wide variety of successful programs and initiatives because we are deeply committed to supporting the careers of all our faculty members, junior and senior alike," said Flier. "This task force has shown us how to continue building an even more inclusive and welcoming community, across all ranks and disciplines—especially for women and underrepresented minorities."

The group identified strategies for surmounting barriers to recruiting women and underrepresented minorities and explored new ways of nurturing the careers of junior faculty members. The Office for Faculty Affairs launched a new website that will become "information central" for all faculty and introduced special orientation events for



Joan Reede, dean for diversity and community partnership, and Alvin Poussaint, professor of psychiatry and faculty associate dean for student affairs, received the prestigious Herbert W. Nickens Award in 2005 and 2010, respectively.

junior faculty. The office is now rolling out processes to speed, simplify and make fully transparent faculty promotions at HMS.

PATHFINDER AWARD TO DIVERSITY DEAN

HMS Dean for Diversity and Community Partnership Joan Reede received a Pathfinder Award from the National Institutes of Health for a project to advance workforce inclusion and diversity. Reede's award of \$2 million over three years was one of six funded nationwide.

In this groundbreaking program, a collaboration between Reede's office and Harvard Catalyst, the Harvard Clinical and Translational Science Center, investigators will further



Celebrating the 20th anniversary of the HMS Visiting Clerkship Program are physicians and program alumnae Magdalena Carter, Class of 2001–02; Melissa Coleman, 2006–07; and Gabrielle Bercy-Roberson, 1995–96.

develop an analytical tool called “Profiles.” They will gather comprehensive data on individuals—demographics, research, teaching and service-related information—and integrate it with practices, policies and opportunities at their home institutions. By illuminating factors that impede or facilitate career entry, persistence and success, HMS will be better equipped to develop policies, practices and programs that lead to increased diversity and inclusion in the sciences.

CHAMPION OF EQUALITY EARNS NATIONAL RECOGNITION

Alvin Poussaint, HMS professor of psychiatry and faculty associate dean for student affairs, accepted the 2010 Herbert W. Nickens Award from the Association of American Medical Colleges in November. The Nickens Award honors individuals who have made exemplary contributions to promoting justice in medical education and health care equality. Since joining HMS in 1969, Poussaint has been pivotal in recruiting large numbers of outstanding underrepresented minority students to the School, integrating them into its fabric, mentoring them and helping launch many into roles as deans and professors in academic medicine nationwide.

For four decades, Poussaint has been a role model for all students. He has helped design curricula and programs that give students opportunities to work with minority patient populations and children at risk of committing violence, and he jumpstarted training to ensure that physicians and students provide culturally competent patient care. As head of the Office of Recruitment and Multicultural Affairs, Poussaint provides an environment in which all students from underrepresented groups are welcomed and their traditions celebrated.

VISITING CLERKSHIP PROGRAM CELEBRATES 20TH YEAR

Diversifying the faculty, staff and student body is of “paramount importance,” said HMS Dean Jeffrey S. Flier at a May 2010 celebration that marked the 20th anniversary of the School’s Visiting Clerkship Program (VCP). “This program is one outstanding example of how the entire HMS community has joined together to introduce minority medical students to academic medicine, internships, residencies and other training programs.” Founded in 1990, the VCP brings fourth-year and selected third-year medical students to HMS and its affiliated hospitals. Many of the 867 graduates enjoy successful careers in academic medicine, policy, education, research and public health, and nearly 40 have returned to join the HMS faculty. “But diversity isn’t about numbers,” said VCP founder Joan Reede, HMS dean for diversity and community partnership. “It’s about capturing the best of everyone in our environment and putting that to use.”

ROBERT WOOD JOHNSON CEO GIVES POUSSAINT LECTURE

“Medicine’s great equalizer is a love for humanity,” said Risa Lavizzo-Mourey, Class of 1979, speaker at the 2010 Alvin F. Poussaint Lecture, held in March and sponsored by the HMS Office for Diversity and Community Partnership and the Alumni Relations office. As Robert Wood Johnson Foundation president and CEO, Lavizzo-Mourey guides the transformation of U.S. health systems so that more people live healthy lives and obtain sorely needed care. A practicing geriatric specialist with business credentials and expertise in shaping national health policy, she was drawn to the post in 2001 by the opportunity to “alter the trajectory and push society to change for the better.”

EXPERTS MONITOR DIVERSITY RESEARCH

Beginning in 1995 and expanding in 2002, the HMS Office for Diversity and Community Partnership has emerged as a national leader in creating pipeline programs that expand minority representation in medicine. Several times a year, HMS Dean for Diversity and Community Partnership Joan Reede and Emorcia Hill, director of the office's research and evaluation arm, convene an 18-member research advisory council, funded by the W. K. Kellogg Foundation, that draws from a national pool of experts in medicine, sociology, law, communications, economics and other disciplines.

One ongoing project is a four-year study that involves 13 partner institutions and seeks to clarify factors affecting entry and advancement of women of color in academic medicine. Another, a study of minority pathways to careers in biomedical medicine, is pinpointing points of reentry and reengagement. And a survey of past visiting minority students to HMS is gauging how they perceive career opportunities for minorities in academic medicine.

INTERNSHIPS INTRODUCE STUDENTS TO HARVARD CATALYST

This past summer, 16 minority students from U.S. medical schools and universities gained firsthand experience in clinical and translational research at HMS. Two programs, sponsored by the Harvard Catalyst Program for Faculty Development and Diversity and now in their second year, introduce students to the process of translating basic science discoveries into new patient therapies.

Five medical students selected for the Visiting Research Internship Program and 11 college students for the Summer Clinical Translational Research Program were assigned a faculty mentor at HMS or an affiliated hospital. Their projects included topics such as the use of magnetic resonance spectroscopy to diagnose chronic pelvic pain, gene and protein biomarkers for inflammatory bowel disease, children's access to antidepressants, health disparities in breast cancer and culturally tailored diabetes therapies.

FRANCIS COLLINS IS CAREERS PROGRAM KEYNOTER

"This is a wonderful time to be getting engaged in biomedical research," said Francis Collins, director of the National Institutes of Health and keynote speaker at the Biomedical Science Careers Program (BSCP) in February 2010. The annual program, sponsored by BSCP and in association with the HMS Office for Diversity and Community Partnership, encourages students to pursue careers in biomedical sciences and health care-related fields. Nearly 1,200 African-American, Hispanic and American Indian/Alaska Native students—from the high-school to postdoctoral level—discussed careers in the basic and clinical sciences, medicine, public health, academic administration and the private sector through workshops, panel presentations and networking sessions. "Research is impoverished," said Collins, "if we don't have representation from all groups whose health we're trying to help." ❁



As a student with Project Success, Anis Abdulle participated in research in the laboratory of George Daley, professor of biological chemistry and molecular pharmacology at Children's Hospital Boston.



Quiet fills the Russell Reading Room of the Countway Library of Medicine.

Researchers at Harvard Medical School and affiliated institutions compete successfully for federal grants and industry support.

RESOURCES

RECOVERY AND REINVESTMENT ACT SUPPORT CONTINUES

Harvard Medical School continues to benefit from the surge in federal funding created by the 2009 American Recovery and Reinvestment Act (ARRA), which has pumped \$10.4 billion into extramural grants awarded by the National Institutes of Health (NIH). In fiscal year 2009, NIH funding to the School remained strong despite ongoing uncertainties over the economy and federal appropriations decisions. Nearly 425 awards from NIH exceeded \$318.8 million. Of that total, ARRA funded nearly \$98 million, or 29 percent. In 2010, ARRA funding created at HMS a total of 158 full-time jobs. HMS-affiliated hospitals and institutes and other schools at Harvard also have garnered significant ARRA support. Following are examples of investigation fueled in 2010.

SMART HEALTH INFORMATION TECHNOLOGY

Two HMS researchers are leading a four-year project to develop a new health care information technology infrastructure, supported by \$15 million from the Office of the National Coordinator for Health Information Technology in the Department of Health and Human Services. Isaac Kohane, the Lawrence J. Henderson Professor of Pediatrics at HMS and Children's Hospital Boston and director of the Countway Library of Medicine, and Kenneth Mandl, associate professor of pediatrics at Children's, are developing an iPhone-like platform. Its SMARt architecture—substitutable medical applications, reusable technologies—will support core services and networked data across the U.S. health system. The researchers will partner with other health care organizations to translate their solutions into real-world practice.

HARVARD CATALYST: COLLABORATION TO ADVANCE HUMAN HEALTH

Harvard Catalyst, the Harvard Clinical and Translational Science Center, convenes investigators from across Harvard's schools and clinical affiliates with a mission to improve health for individuals and their communities. This virtual center, directed by Dean for Clinical and Translational Research Lee Nadler, the Virginia and D.K. Ludwig Professor of Medicine, was launched in 2008 with a five-year, \$117.5 million NIH grant to HMS and nearly \$75 million from Harvard University, HMS and the affiliated hospitals. Harvard Catalyst provides an academic home where clinical and translational investigators can advance their education, obtain critical research consultations, identify collaborators, form teams, and discover and access unique resources.

To date, Harvard Catalyst has funded nearly 190 pilot grants that have brought together more than 1,000 investigators from across Harvard to undertake high-risk, high-impact projects in clinical and translational research.

Harvard Catalyst, as the lead site, was awarded an ARRA grant of \$15 million to join with eight other U.S. universities to build and implement an informatics platform—known as eagle-i—for supporting discovery and, ultimately, for sharing research resources. Co-directed by Douglas MacFadden, director of the Informatics Technology Center for Biomedical Informatics at HMS, and Lee Nadler, eagle-i will “make the invisible visible” by cataloging highly diverse research resources. Like amazon.com, eagle-i will not only make it easier to find unique research resources, but will also forge robust connections that amplify the power of existing biomedical databases.



Graduate students exchange ideas within the Jeffrey Modell Immunology Center at HMS.

HMS IN NATIONAL PROGENITOR CELL CONSORTIUM

Two HMS research teams are among 18 teams nationwide awarded a seven-year, \$170 million grant from the National Heart, Lung and Blood Institute (NHLBI). Under the banner of the NHLBI Progenitor Cell Biology Consortium, these groups of heart, lung, blood and technology researchers are exploring new avenues in stem and progenitor cell research. Stem cells can be renewed indefinitely or be directed to selectively differentiate, but progenitor cells' fates are more limited. Researchers will characterize progenitor cell lines, direct stem and progenitor cell differentiation to desired cell fates, and address the clinical challenges involved in transplanting these cells.

Leading one HMS hub is David Scadden, the Gerald and Darlene Jordan Professor of Medicine at Massachusetts General Hospital and director of the Harvard Stem Cell Institute. With researchers at Texas Southwest Medical Center, Scadden's team is studying how the cellular microenvironments within heart, lung and bone marrow control progenitor cell fate. Another HMS hub is led by George Daley, HMS professor of biological chemistry and molecular pharmacology and an associate professor of pediatrics at Children's Hospital Boston, and Kenneth Chien, the Charles Addison and Elizabeth Ann Sanders Professor of Basic Science at Mass General. Daley and Chien are developing induced pluripotent stem cell models of human disease to advance regenerative therapy for cardiac and blood disorders.

CONTRACT BOOSTS RESEARCH IN CELL THERAPY

Leslie Silberstein, HMS professor of pathology (pediatrics) in the Program in Cellular and Molecular Medicine at Children's Hospital Boston and the Immune Disease Institute, was awarded a Production Assistance for Cellular Therapies contract by NIH. The five-year, \$14.5 million award will fund cellular therapy research in several areas, including immunotherapy for cancers and infectious diseases and stem cell therapy for congenital and acquired disorders. The award enables the Center for Human Cell Therapy (CHCT) Boston, led by Silberstein with Jerome Ritz, HMS professor of medicine at Dana-Farber Cancer Institute, to become one of four cell-processing facilities nationwide. It involves all major HMS-affiliated institutions and the Harvard Stem Cell Institute. CHCT will identify researchers who have developed successful cell-based therapies in preclinical model systems and support the translation of their research for evaluation in patients.

GRANT POWERS BACTERIAL FUEL CELL

The Wyss Institute for Biologically Inspired Engineering received a \$4.2 million grant from the U.S. Department of Energy to develop advanced microbial biofuels that convert sunlight into electricity. Selected from 540 applicants, the HMS project is one of 37 considered to have high potential. The project involves three founding core faculty members of the Wyss: Pam Silver, project leader and HMS professor of systems biology; George Church, HMS professor of genetics; and Jim Collins of Boston University.

Current biofuel technologies, which rely on photosynthesis, are highly inefficient, converting only about 1 percent of absorbed sunlight into stored chemical energy. Wyss researchers will develop a bacterium that will use electricity to produce fuel rather than use fuel to generate electricity—ultimately converting carbon dioxide into gasoline. Researchers also will study the metabolism of the reengineered bacteria.

NIH COMMON FUND STUDIES: HIGH RISKS, BIG GAINS

Five members of the HMS research community received new funding in 2010 from the NIH Common Fund to pursue novel, high-risk research—work with the potential to speed discovery and yield fundamental advances.

Pioneer Awards. Two HMS scientists were honored with NIH Director's Pioneer Awards, which confer up to \$2.5 million over five years. They are Jae Keith Joung, HMS associate professor of pathology at Massachusetts General Hospital, who engineers "designer" DNA-binding domains; and Bruce Yankner, HMS professor of pathology and neurology, who researches the molecular basis of brain aging and disease processes that perturb normal function. Since 2004, the Pioneer Award has honored 81



scientists of exceptional creativity who propose groundbreaking approaches to major challenges in biomedical and behavioral research. In 2010, Joung and Yankner were among 17 recipients from the United States.

New Innovator Awards. Three other members of the HMS Community were among 33 early-career scientists throughout the nation to receive support through the Director's New Innovator Award. Recipients receive up to \$1.5 million each in direct grants over five years. The HMS faculty members are Nathalie Agar, instructor in surgery at Brigham and Women's Hospital, for developing tissue analysis methods using mass spectrometry to assist in evaluating tumor boundaries during surgery; Sandeep Robert Datta, assistant professor of neurobiology at HMS, for exploring circuits in the brain that detect and respond to



odors; and Conor Evans, instructor in dermatology at Massachusetts General Hospital, for investigating imaging techniques, such as optical coherence tomography, that will be useful in studying and treating cancer and other disorders.

Transformative Research Project Awards. Two research groups led by HMS investigators were among 20 nationwide to receive funding through the NIH Director's Transformative Research Projects program, part of the NIH Common Fund. These prestigious T-R01 grants also support extraordinarily innovative work with the potential to exert tremendous impact in basic or clinical science. These grants require no preliminary data and impose no budget caps.

One team includes Paola Arlotta, assistant professor of surgery at Massachusetts General Hospital, Jae Keith Joung, associate professor of pathology at Mass General, and Feng Zhang, a research fellow in genetics at HMS. They are studying genome-wide, light-inducible tuning of transcriptional network dynamics, seeking to identify and apply new technologies that use molecular regulators to regenerate components of the nervous system and treat neurodegenerative diseases.

A second group is led by Simon Dove, assistant professor of pediatrics (microbiology and molecular genetics) at Children's Hospital Boston and the Immune Disease Institute, and Bryce Nickels of Rutgers University. The researchers will investigate nanoRNA-mediated control of gene expression to determine the extent to which tiny RNA fragments are involved in initiating gene transcription.

NIH LAUNCHES CENTER TO EXPLORE PROTEIN STRUCTURE

James Chou, an HMS associate professor of biological chemistry and molecular pharmacology, is the recipient of a \$13 million grant from the National Institute of General Medical Sciences that will be distributed over five years. The award, part of an NIH effort launched in 2000 called the Protein Structure Initiative, will be used to establish a center dedicated to illuminating the structure of membrane proteins important in biology and medicine.

Chou, one of nine grant recipients who will study membrane proteins, plans to use solution nuclear magnetic resonance techniques to elucidate structures with high biological impact. Although membrane proteins represent nearly half of all drug targets, technical challenges to solving their structure pose major hurdles in drug design.

Harvard Office of Technology Development

LINKING SCIENCE AND BUSINESS TO ADVANCE HUMAN HEALTH

Throughout HMS, investigators are making discoveries at an unprecedented rate, driving next-generation technologies and medical progress. The Harvard Office of Technology Development (OTD) speeds the development of faculty discoveries in three principal ways: by protecting intellectual property, by fostering creative alliances with strong industry collaborators through sponsored research agreements and licensing transactions covering new inventions, and through an innovative gap-funding program that provides competitive grants supporting proof-of-concept research to accelerate new inventions from discovery to the commercial development stage.

Now in its fourth funding round, Harvard's Accelerator Fund provides the bridge financing required to satisfy the validation criteria necessary to attract investment by industrial partners. A total of \$1 million was slated for five projects selected for funding in 2010. The principal investigators and projects are:

- Jonathan Beckwith, HMS American Cancer Society Professor of Microbiology and Molecular Genetics, for the project "Screen for Inhibitors of Both Major Disulfide Bond Formation Pathways Used by Bacterial Pathogens."
- John Flanagan, HMS professor of cell biology for the project "Design and Testing of a New Approach to Promote CNS Axon Regeneration."
- Roberto Kolter, HMS professor of microbiology and

Edwin “Jake” Wintermute, a graduate student in the laboratory of Professor of Systems Biology Pamela Silver, explores how cyanobacteria use sunlight to capture carbon, part of a larger effort to develop alternative energy sources.



molecular genetics, and Richard Losick, Harvard University Faculty of Arts and Sciences and the Maria Moors Cabot Professor of Biology in the Department of at HMS, for the project “Developing D-Amino Acids as Anti-Biofilm Drugs.”

- Lee Rubin, director of translational medicine for the Harvard Stem Cell Institute, and Andrew McMahon, Harvard University Faculty of Arts and Sciences, Frank B. Baird Jr. Professor of Science in the Department of Stem Cell and Regenerative Biology at HMS, for the project “Smoothed Inhibitors for Cancer Therapy.”
- Ulrich von Andrian, the HMS Edward Mallinckrodt Jr. Professor of Immunopathology, for the project “Using Tolerogenic Dendritic Cells to Treat Autoimmune Disorders.”

BRINGING NEW TECHNOLOGIES TO MARKET

Working with pharmaceutical and biotechnology companies, as well as venture capitalists and entrepreneurs, OTD helps usher discoveries from the laboratory to the commercial setting. In all industry agreements, care is taken to protect academic freedom and to ensure that faculty retain unlimited rights to publish and present their research. Throughout the past five years, the dollar value of industry-sponsored research at HMS has increased steadily, representing approximately 30 percent of total extramural research funding in 2010. Three examples of new technologies that have recently been licensed by HMS are:

Novel pain treatment. Bruce Bean, professor of neurobiology at HMS, and his colleagues have developed an entirely new technology for treating pain. Their approach uses a combination of two drugs to inhibit pain without affecting other sensations, thereby avoiding the

typical anesthetic side effects of numbness or motor inhibition. HMS has forged an exclusive agreement with Endo Pharmaceuticals, which will invest significantly in the development of this technology for clinical and commercial application.

Advanced organ-preservation solution. A major impediment to successful organ and tissue transplants is the difficulty of maintaining viable organ and tissue preservation outside the body. Given the severe shortage of organs suitable for transplantation, many patients die before a vital organ becomes available. In an effort to increase the donor pool and improve long-term clinical outcomes, the late Shukri Khuri, HMS professor of surgery, and Hemant Thatte, assistant professor of surgery, both of Brigham and Women’s Hospital, and colleagues developed a novel solution for preserving organs and tissues that greatly prolongs storage time. Harvard has granted a license for this technology to SomahLution, a start-up company formed to develop the solution for clinical application.

Revolutionizing vaccines. An antigen-screening platform developed by Darren Higgins, HMS professor of microbiology and molecular genetics, will be commercialized by the startup company Genocea Biosciences. Higgins’ groundbreaking technology relies on a novel *in vitro* system that mimics the mammalian immune system, providing an effective screening method for antigens that elicit a T-cell response *in vivo*. By using this high-throughput technology to test every antigen expressed by a given disease agent in the host, specific antigens that effectively stimulate the immune system can be identified within hours, a feat previously impossible. This technology has the potential to revolutionize the development of vaccines against infectious diseases, many of which are caused by microbes that have developed resistance to standard drugs. Genocea is developing a *Chlamydia* vaccine and hopes to initiate vaccines for malaria and herpes. 🌟

FACTS AND FIGURES

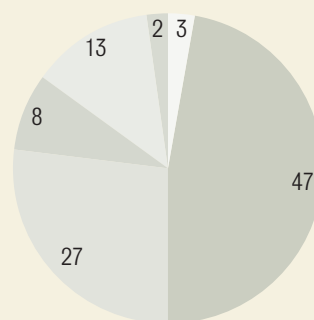
Financial Summary

HMS ended fiscal year 2010 with a decrease in net assets of \$31.4 million, due primarily to a strategic decision to extinguish \$28.5 million of debt and finance an additional \$4.2 million of assets with equity. Excluding these measures, net assets for the year increased by \$1.3 million.

Operating revenues grew by 6 percent, to \$588 million. Sponsored research revenue rose by 13 percent, largely due to researchers' success in obtaining federal stimulus, or ARRA, funding. Rental income also rose by 8 percent as vacant space was leased.

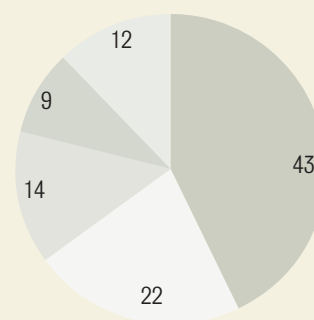
Total operating expenses increased by \$62 million to \$619.5 million, reflecting the increase in expenditures on debt service and equity funding of capital as well as growth in sponsored research activity. Plant operations expenses decreased by 11 percent due to lower utilities and operating expenses.

HMS continues to build a long-term financial framework that will allow the School to retain its preeminent reputation while investing in capital, maintaining an appropriate level of debt and keeping educational programs affordable.



OPERATING REVENUE

Tuition (net)	\$16,651,431	3%
Research grants and contracts	278,345,786	47%
Endowment income	156,813,505	27%
Rental income	45,841,499	8%
Other revenues (e.g., continuing medical education, publications, royalties)	78,627,222	13%
Gifts for current use	11,752,914	2%
	<u>\$588,032,357</u>	



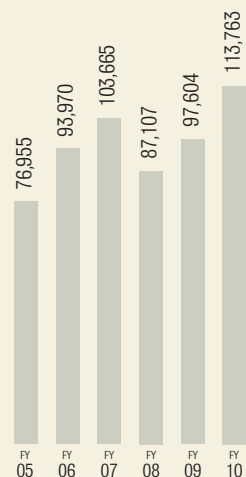
OPERATING EXPENSES

Personnel cost	\$263,504,440	43%
Supplies and other expenses	137,786,040	22%
Debt service (principal and interest)	88,560,361	14%
Plant operations	52,985,204	9%
Pass-through expenses*	76,619,987	12%
	<u>\$619,456,032</u>	

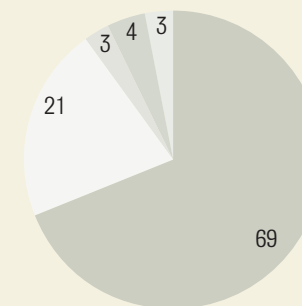
* Includes research subcontracts and hospital affiliate expenses

Fundraising Highlights

Harvard Medical School depends upon thousands of friends, alumni, organizations, faculty and staff to advance medicine and science for the benefit of people worldwide. In fiscal year 2010, gifts and pledges to the School exceeded \$113 million, fueling biomedical research and training students to lead and to innovate within their chosen fields.



TOTAL HMS GIFTS AND PLEDGES
FY05-FY10 (\$ IN MILLIONS)



FY10 GIFTS AND PLEDGES BY PURPOSE

Teaching/research	\$78,855,356	69%
Professorship/faculty support	\$24,448,984	21%
Other	\$3,241,907	3%
Financial aid/student support	\$4,207,211	4%
Discretionary/unrestricted	\$3,009,978	3%



THE HARVARD MEDICAL COMMUNITY

Total MD students	725
Total PhD students	569
*MD-PhD	
basic sciences	138
social sciences	17
(*included in MD and PhD totals above)	
Total DMD students	148
Trainees (residents and postdoctoral fellows)	9,376
Total faculty	11,484
Tenured and tenure-track faculty on the HMS campus, in 10 preclinical departments	142
Voting faculty, HMS campus and affiliates	4,642
Full-time faculty, HMS campus and affiliates	8,579
Medical school alumni	9,206
Nobel Prizes (in Medicine or Physiology; Peace)	9 prizes; 15 recipients
Howard Hughes Medical Institute investigators	28
Institute of Medicine members	131
National Academy of Sciences members	67

STUDENTS ENTERING IN 2010

MD (includes 13 MD-PhD students)	165	
PhD	97	
DMD	35	
Applicants	5,324	
Admitted	235	4.4%
Matriculated (includes 15 MD-PhD students)	165	70%
Men	92	56%
Women	73	44%
Underrepresented in medicine (African-American, Native American, Hispanic)	34	21%
Asian	53	32%
Additional joint-degree programs: MD-MBA; MD-MPH; MD-MPP		

RESEARCH COLLABORATIONS ACROSS HARVARD UNIVERSITY

Broad Institute of MIT and Harvard
Harvard Catalyst
Harvard Stem Cell Institute
Wyss Institute for Biologically Inspired Engineering

17 AFFILIATED HOSPITALS AND INSTITUTES

Beth Israel Deaconess Medical Center
Brigham and Women's Hospital
Cambridge Health Alliance
Children's Hospital Boston
Dana-Farber Cancer Institute
Forsyth Institute
Harvard Pilgrim Health Care
Hebrew SeniorLife
Joslin Diabetes Center
Judge Baker Children's Center
Massachusetts Eye and Ear Infirmary
Massachusetts General Hospital
McLean Hospital
Mount Auburn Hospital
Schepens Eye Research Institute
Spaulding Rehabilitation Hospital
Veterans Affairs Boston Healthcare System

Dean's Report 2010–2011

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Dean of the Faculty of Medicine

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Jules Dienstag, MD
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(as of July 1, 2010)*

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(through June 30, 2010)*

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