NYU PHYSICIAN

THE MAGAZINE OF NEW YORK UNIVERSITY SCHOOL OF MEDICINE

SPRING 2011
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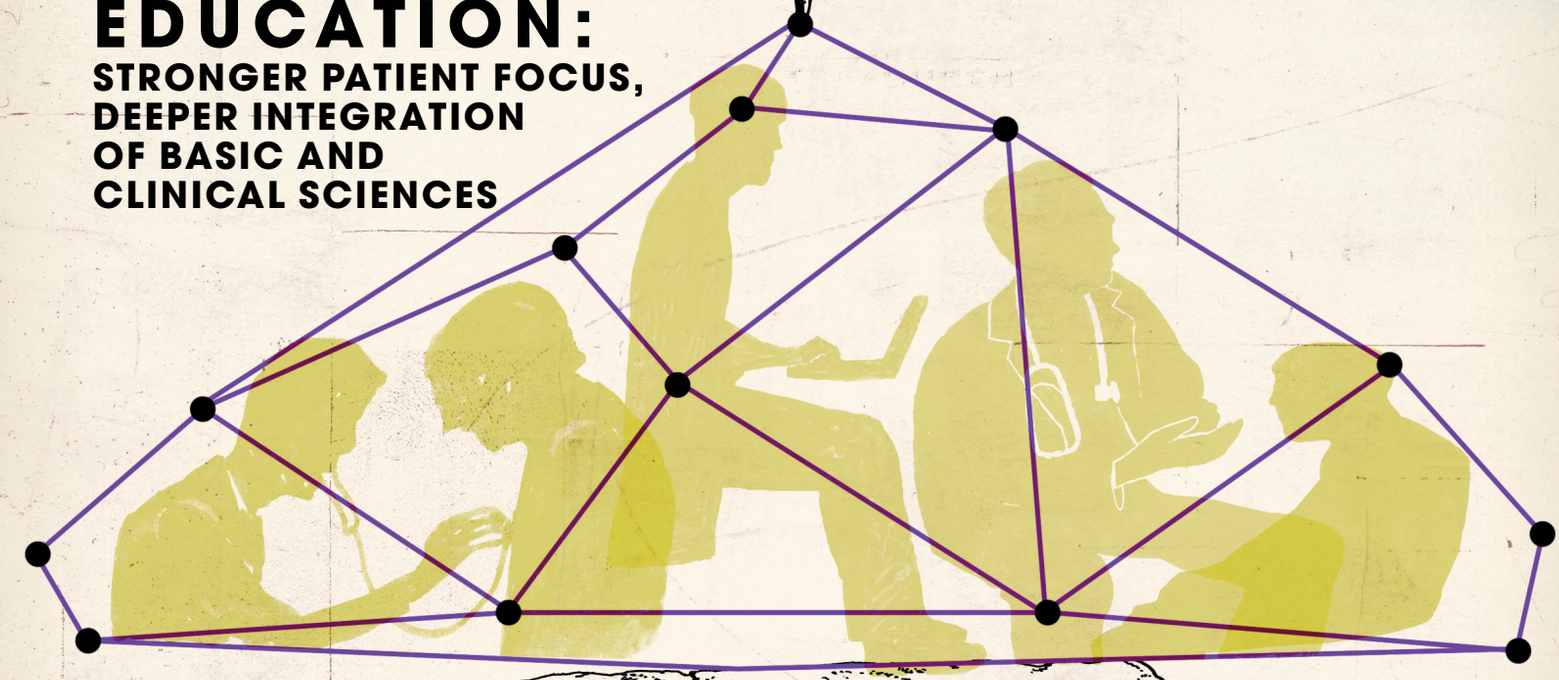
RESHAPING MEDICAL EDUCATION:

STRONGER PATIENT FOCUS, DEEPER INTEGRATION OF BASIC AND CLINICAL SCIENCES



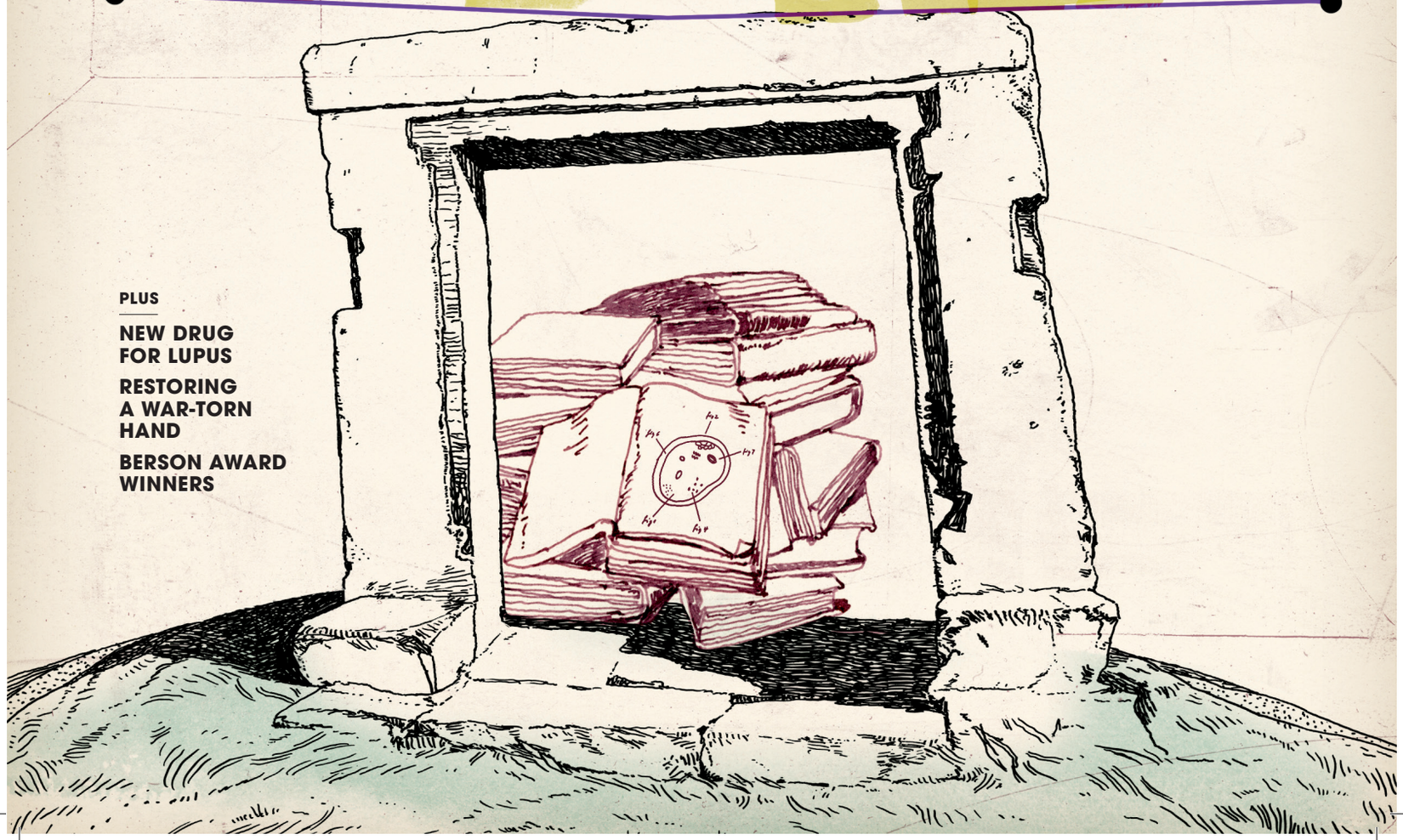


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ILLUSTRATION BY LAURA CARLIN

"OUR GOAL IS TO CREATE A TRULY PATIENT-CENTERED CURRICULUM, WHERE STUDENTS LEARN ABOUT MEDICINE BY STUDYING REAL PATIENTS."

COVER STORIES

DEPARTMENTS

TO OUR READERS
NYU Physician is available as an App that you can download free from iTunes.

NYU Langone Medical Center

Message
from the Dean
& CEO

Changing the Paradigm

THIS ISSUE OF NYU PHYSICIAN MAGAZINE is particularly close to my heart because it shows the results of the enormous effort that has been made to improve the way we train the next generation of physicians. It is perhaps one of the biggest changes in medical education since the medical school system as we know it was created 100 years ago by Abraham Flexner.

Our new curriculum continues our medical education leadership and offers us an opportunity to shape the future of medical care. It is also integral to our goal of being among the top medical schools in the nation. We believe our new curriculum—with its innovative use of technology, more and earlier direct patient contact, and the potential for students to earn dual degrees—will help us draw the highest caliber students. In addition, we believe it will help us recruit and retain top talent for faculty positions; when considered holistically, this enhances not only the reputation of the School of Medicine, but that of the entire Medical Center.

In these pages you will find stories that illuminate our innovative Patient-based Longitudinal Ambulatory Clinical Experience (PLACE) program, providing students with a patient-centered clinical experience starting their first week of school, as well as stories that shed light on the technologies that are transforming when, where, and how students learn. You will also meet some of the faculty members who have worked hard to bring about the changes in the curriculum, which we hope will serve as a model nationally and perhaps internationally.

The new curriculum has been fully implemented only for the class of 2014, so we do not yet know how it will impact the training of physicians. But so far, I am proud to report that the innovations being introduced are winning over students and faculty alike. •

Bob

DEAN & CEO ROBERT I. GROSSMAN, MD

The Class of 2014 By the Numbers

7,241
Total applications received for admission to NYU School of Medicine

956
Interviews granted

162
Class size

29%
New York residents

12%
Underrepresented minorities

51%
Women

A Half-Century Later, a New Drug for Lupus

Clinical trials at NYU Langone Medical Center contribute to approval of first targeted therapy for this autoimmune disorder.

The Food and Drug Administration's recent approval of Benlysta to treat lupus is an important milestone in the efforts to understand this debilitating and chronic autoimmune disease. Although the drug helped only a portion of patients tested in North America, it is the first to target the disease, opening the way to even more effective medicines.

Cell aggregates in the blood (top slide) and tissues are associated with lupus.

"This is big news for people with lupus," says Anca D. Askanase, MD, assistant professor of medicine, who led late-stage clinical trials of Benlysta at NYU Langone Medical Center. "While it isn't a cure and it might not work for everybody, it is superior to our current standard of care." Benlysta is the first new medication for lupus in 56 years.

Lupus is a little-understood disease in which the immune system becomes overactive, producing antibodies that attack various tissues and organs, such as the skin, joints, kidneys, heart, and brain. While some people experience only mild rashes and arthritis, others suffer debilitating fever, fatigue, and joint pain, or severe life-threatening kidney disease. Another puzzling aspect of the disorder is that it affects women far more often than men.

People with lupus are typically treated with several drugs, including antimalarials, nonsteroidal anti-inflammatories, steroids, and other powerful immunosuppressants. While these medications can help reduce symptoms and sometimes induce remission, they can also have significant side effects. Steroids, in particular, commonly cause insomnia, osteoporosis, and muscle weakness.

Benlysta, administered intravenously, was specifically designed to suppress a key mediator of the immune response, B-lymphocyte stimulator (BLyS) protein. The protein spurs the production of B cells, the body's launching pad for antibodies. People with lupus have elevated levels of BLyS, and it was hoped that inhibiting the protein would quiet the disorder.

Phase III clinical trials showed that Benlysta, combined with standard therapy, significantly reduced the severity of symptoms and lowered several blood biomarkers of the disease, compared to standard treatment alone, according to the results of the trials, published in the February 26, 2011, issue of *Lancet*.

The results held more promising news for people with lupus in suggesting that many patients taking Benlysta experienced fewer flares of the disease, and some were able to reduce their reliance on steroids. The drug's manufacturer estimates that some 200,000 patients would benefit from the drug.

"Benlysta may also be a treatment option for patients who cannot tolerate any of the standard medications," says Jill P. Buyon, MD, professor of medicine, who played a key role in designing the instrument used to measure lupus activity in the trials.

Although African Americans did not appear to respond to treatment with Benlysta in the trials, the studies lacked sufficient numbers to reach a definitive conclusion. The manufacturer, Human Genome Sciences, based in Rockville, Maryland, has agreed to an additional trial to ascertain whether African Americans may benefit from the medicine.

"It's disappointing because African Americans often get a more serious form of the disease, and we want a drug that will help them," says Dr. Buyon, who has served as a paid consultant to Benlysta's manufacturer. "But at the moment there is no reason to think they would not be appropriate candidates for treatment."

As with any new drug, it remains to be seen how well Benlysta will work in the wider patient population. Nonetheless, says Dr. Askanase, "Everybody is excited about Benlysta. At the very least, it offers hope that we are beginning to understand this disease and that someday we'll have even better therapies and perhaps a cure." ●

—GARY GOLDENBERG

MICROGRAPH IMAGES (TOP) GARRY DELONG (BOTTOM) BIOPHOTO ASSOCIATES/PHOTO RESEARCHERS, INC.


Isaac Wirgin

A Fish Story Told in the Evolutionary Wink of an Eye

Surviving high levels of PCBs in the Hudson River

Evolution is usually thought to occur over millennia, but the little Atlantic tomcod shows that nature can act swiftly to ensure survival in the face of adversity. A research group led by population geneticist Isaac Wirgin, PhD, associate professor of environmental medicine, recently reported that the tomcod population in the Hudson River has evolved a genetic variant that allowed the fish to live in waters heavily polluted by PCBs—an adaptation that took place over 50 years, a mere evolutionary wink.

"We've found evolutionary change going on very quickly, probably due to toxic exposure, and just a single mutation at one gene is responsible for it," says Dr. Wirgin, the lead investigator of the study published in the March 11, 2011, issue of *Science*. "There are not many examples of this in the scientific literature."

PCBs, or polychlorinated biphenyls, were used in hundreds of industrial and commercial applications, especially as electrical insulators. First introduced in 1929, the chemical was banned 50 years later.

The 10-inch tomcod are champions at survival, especially since PCBs accumulate in river bottoms, where the fish feed. General Electric discharged approximately 1.3 million pounds of PCBs into the Hudson River from 1947 to 1976. Like other fish in the river, the tomcod were affected—scientists continued to find liver tumors in nearly 95 percent of older adult tomcod living in polluted areas of the river in the early 1980s—but they somehow persisted.

Amazingly, the tomcod not only survived this devastation, their numbers actually rebounded. To find out why, Dr. Wirgin and scientists at NOAA Fisheries Service in New Jersey and the Woods Hole Oceanographic Institution in Massachusetts spent four years capturing tomcod from contaminated and relatively clean areas of the Hudson River during the winter months, when tomcod spawn. The fish were screened for genetic variants in a gene—the aryl hydrocarbon receptor 2, or AHR2—that encodes a protein known to regulate the toxic effects of PCBs. This gene is also involved in mediating the effects of other halogenated hydrocarbon compounds, a group that includes PCBs.

Slight alterations—the deletion of only six base pairs in the DNA of the AHR2 gene—appear to protect tomcod from PCBs, according to the study. Normally, when unaltered AHR2 binds to PCBs, it triggers a cascade of reactions that transmit the toxic effects of the compound. However, the study found that it takes about five times more PCBs to substantially bind to the variant AHRs, which effectively blunts the chemicals' effects.

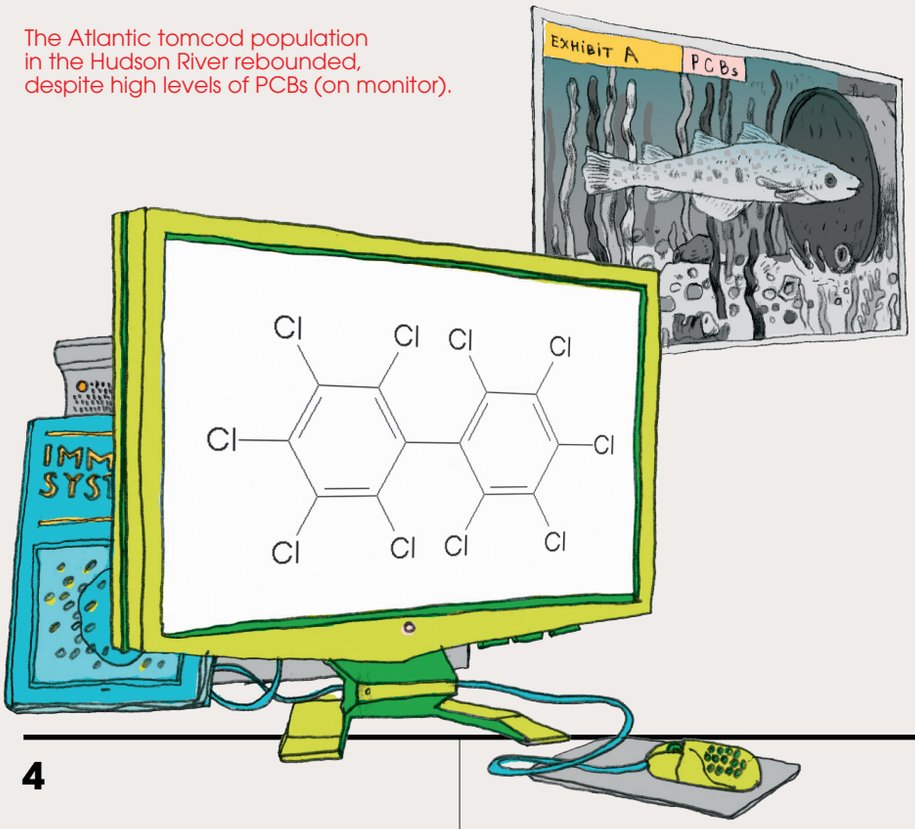
About 5 percent of tomcod from cleaner estuaries near the Hudson carry mutant AHR2, suggesting that these variants existed in minor proportions prior to PCB pollution, Dr. Wirgin says. After the toxin was released, those tomcod carrying the mutation had an advantage over others because, without it, PCB exposure led to lethal heart defects and tumors in young fish. Today, 99 percent of tomcod in polluted regions carry the mutant gene.

Pollution has driven other animals to adapt as well: One species of moth in England during the Industrial Revolution evolved darker pigmentation to improve its disguise among soot-covered trees, and Atlantic killifish now survive PCBs, although the mechanism for this isn't known.

Diane Nacci, PhD, a biologist at the U.S. Environmental Protection Agency who focuses on the response of aquatic life to pollution, warns that resilience shouldn't be considered an unmitigated biological triumph. Even though people don't typically consume tomcod, many other fish eat them and their toxic contents may be passed along the food chain. ●

—AMY MAXMEN

The Atlantic tomcod population in the Hudson River rebounded, despite high levels of PCBs (on monitor).



ILLUSTRATIONS BY
PETER OUMANSKI

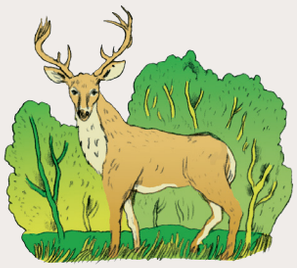
Misshapen proteins called prions riddle the brains of cows infected with mad cow disease. A related disease is spreading among deer and elk in the Western U.S. A transmission electron microscope captured the colored prion image seen above.

Stopping an Epidemic on the Hoof

An experimental vaccine may prevent chronic wasting disease in deer.

In the 1990s, an epidemic of mad cow disease swept through British cattle herds, then jumped from animals to humans, causing a wave of brain-wasting disease that claimed more than 200 lives. Now a related disease is spreading among deer and elk herds throughout the Western states, and like mad cow, the fatal infection—called chronic wasting disease (CWD)—threatens to jump species, with the potential to infect people who eat venison. But help may be on the way: Thomas Wisniewski, MD, professor of neurology, pathology, and psychiatry, has developed and is testing a vaccine that could stop the infection in its tracks.

CWD and mad cow disease are members of a family of rare progressive neurodegenerative disorders that affect both humans and animals. An unusual infectious agent, a prion—a misshapen version of a normal cellular protein—causes the disorders. Dr. Wisniewski has treated patients with a related condition, Creutzfeldt-Jakob disease (CJD), that is either hereditary or arises spontaneously. Victims quickly develop dementia, lose mental function, and die in about six months. "It's the most horrible disease to watch," he says. "They're literally going downhill from day to day, and there's nothing you can do about it."



A decade ago, Dr. Wisniewski and his team began work on a vaccine for prion diseases, but there was a challenge: The immune system typically doesn't attack normal tissue, and it wasn't expected to attack prions. Doing so might harm normal tissue in an autoimmune reaction. Dr. Wisniewski's lab developed an oral vaccine that protected mice from the animal equivalent of CJD. He started with a harmless strain of *Salmonella* bacteria developed by collaborators at the University of Uruguay and engineered it to deliver prion protein to the intestine. There, they reported in *Neuroscience* in 2008, the vaccine spurred a powerful immune response that kept prions from invading the body, but it evoked only a mild response in the bloodstream, avoiding an autoimmune attack.

Dr. Wisniewski is collaborating with Edward Hoover, DVM, PhD, a veterinarian and microbiologist at Colorado State University, to test a similar oral vaccine for CWD, which infects up to 30 percent of the deer and elk in Colorado and other areas where they're endemic. Each year hunters kill thousands of these animals for meat for their families and friends. Because the disease can infect monkeys, whose physiology is similar to that of humans, and because cooking doesn't affect the ability of prions to infect, explains Dr. Wisniewski, it poses a genuine threat to humans.

Early last year, Dr. Wisniewski's team vaccinated 12 mule deer held in a special facility at Colorado State University that protects workers and wild animals from CWD. Six animals were administered the vaccine; the other six received the vaccine minus the prion protein. Since then, antibodies have shown up in the blood and saliva of the animals vaccinated with the protein. In late 2010, all 12 deer were exposed to prions to determine whether those vaccinated will be protected; the results won't be known until later this year. If the trial is successful, the vaccine would be the first one against prion disease. Down the road, Dr. Wisniewski says, "We want to see whether this immune modulatory approach can work for genetic forms of human prion disease." ●

—DAN FERBER

MICROGRAPH OF PRION: EM UNIT, VLA/PHOTO RESEARCHERS, INC.

Sing a Song of Interneurons

A long-neglected type of neuron finally gets attention.


Gordon Fishell

Although researchers have made significant progress in identifying and treating debilitating mental illnesses in the past decade, the underlying mechanisms in diseases like autism and schizophrenia have remained elusive. Now Gordon Fishell, PhD, professor of cell biology and director of the Smilow Neuroscience Program, is making inroads in our understanding with pioneering research on a long-neglected element of the brain: interneurons.

This type of neuron, which makes up about 20 percent of the brain's cells, is the middleman that relays and filters chemical signals between neurons in localized areas of the brain. They are increasingly being linked to the brain's ability to process information. "Interneurons refine the information your brain gathers so it can select what to attend to and what to ignore," says Dr. Fishell, who reports on the latest findings from his laboratory in the April 3, 2011, online issue of *Nature*.

Dr. Fishell's laboratory has created novel methods for tracking the birth of specific populations of interneurons among billions of cells in the developing brains of mice. While the brain begins forming shortly after conception, interneurons don't make their appearance until the third trimester, when the brain starts to hum with chemical and electrical activity. Arising deep in the basal ganglia, these nerve cells migrate to the cortex, the section of the brain responsible for thought, language, and other higher functions, and distribute themselves among the different areas and layers of cortex. There they develop cables and branches: axons that send information to other neurons and dendrites that collect information from other neurons.

But how do the young interneurons know where in the cortex to settle and what connections to make? Dr. Fishell wondered if the emerging brain's chemical and electrical humming might hold the answer. "We suspected that this early activity affects the layout and development of the interneurons," Dr. Fishell says. "The new cells 'hear' these 'songs' normally, but what happens if they don't?"

To find out, Dr. Fishell and his team used a genetic trick to tweak mouse interneurons to be deaf to the brain's ambient electrical opus. Once hearing was muffled, two types of interneurons, named reelin-positive and calretinin-positive after the proteins they produce, settled in deeper cortical layers than normal. They also grew malformed dendrites and axons, stunting their communication with other neurons.

In more refined experiments, the researchers also tried turning off interneuron hearing at different points in their maturation. When the cells could tune in to the brain's song during migration, they could find their way to their proper place in the cortex, but when hearing was then shut down in the cortex, the axons and dendrites grew abnormally. The obverse was true as well: When hearing was turned off during migration, travel stopped, and the interneurons set permanently in the wrong position. However, if hearing was subsequently restored, the axons and dendrites, although not in their normal place, grew correctly.

Dr. Fishell now suspects that interneurons' inability to hear the brain's song could underlie illnesses like autism and schizophrenia, which past studies have linked to poor interneuron migration and function. The new research is "very fascinating," says Arnold Kriegstein, MD, PhD, director of the Eli and Edythe Broad Center of Regeneration Medicine and Stem Cell Research at the University of California, San Francisco. "It means we could possibly treat some mental disorders by changing the environment the cells are in." ●

—GISELA ANGELA TELIS

Interneurons, seen under a laser confocal microscope, listen to the brain's musical overtures.

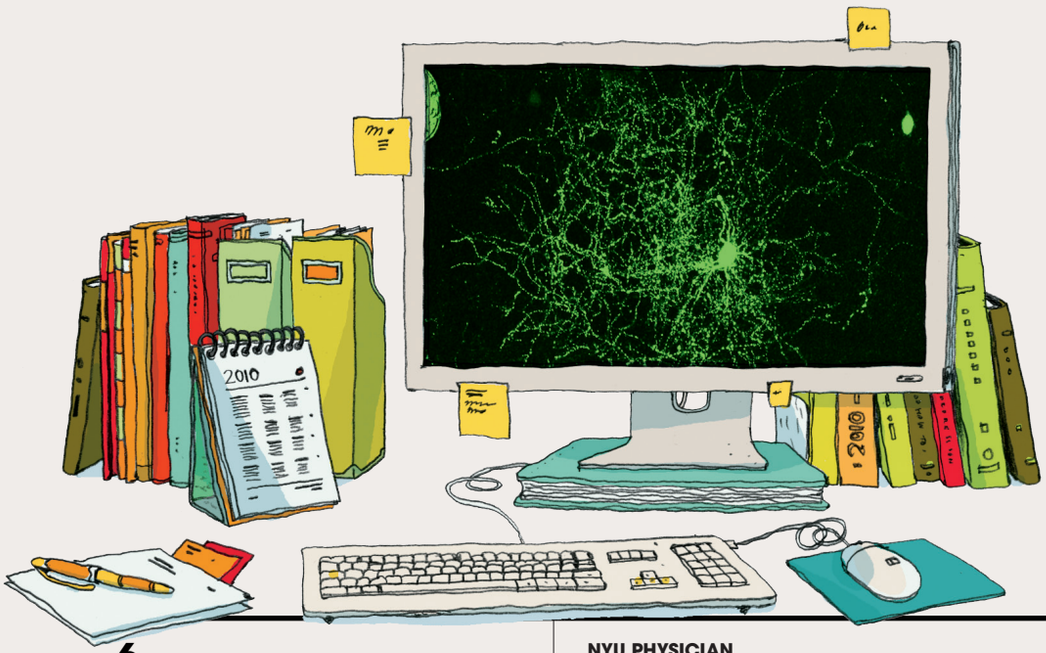


IMAGE COURTESY OF GORDON FISHELL, PHD.

ILLUSTRATIONS BY
PETER OUMANSKI

When the Cell's Recyling Centers Break Down

A clinical trial is set for a rare disease linked to lysosomes.

Like any home, a cell needs a functioning waste system. But sometimes a cell's trash cannot be properly handled, and the result can be catastrophic. Tay-Sachs disease, which is fatal when it strikes in the first years of life, is linked to glitches in lysosomes, the cell's recycling centers. A different genetic flaw in lysosomes that leads to the deficiency or total lack of a particular enzyme is the cause of more than 40 rare conditions.

Enzyme replacement therapy has proved effective for some of these disorders, including Gaucher disease and Fabry disease, and now a multicenter clinical trial of this type of infusion therapy is set to begin for another of these conditions, cholesterol ester storage disease (CESD).

Edwin H. Kolodny, MD, the Bernard A. and Charlotte Marden Professor of Neurology, who will lead NYU Langone Medical Center's portion of the clinical trial, is recognized worldwide for his basic and clinical studies of Tay-Sachs disease and other lysosomal storage disorders, reaching back four decades. In the early 1970s, he helped identify the enzyme defect in Tay-Sachs disease, which affects mainly people of Eastern European Jewish ancestry.

The defect in people with CESD revolves around the acid lipase enzyme, which helps digest fats and isn't produced in sufficient quantities in patients' lysosomes. The result is a toxic buildup of lipids in the body's tissues and serious liver disease. While the root cause of CESD has been known for decades, researchers have struggled to translate that knowledge into a workable therapy.

"The main challenge," Dr. Kolodny says, "was to figure out how to make large quantities of the enzyme that is missing in CESD and to make it free of contaminants, such as potentially harmful proteins or viruses."

Finally solving the problem, scientists at Synageva BioPharma, based in Lexington, Massachusetts, figured out how to produce pure acid lipase in volume. The replacement enzyme was tested in a naturally occurring mouse model of CESD, and last February the company received FDA approval for a phase I/II clinical trial in 12 patients at nine medical centers.

It may take nine months or longer to recruit trial participants, an indication of the rarity of CESD. Most liver specialists have never seen a case of this so-called orphan disease (generally defined as one that affects fewer than 200,000 people in the United States), Dr. Kolodny says.

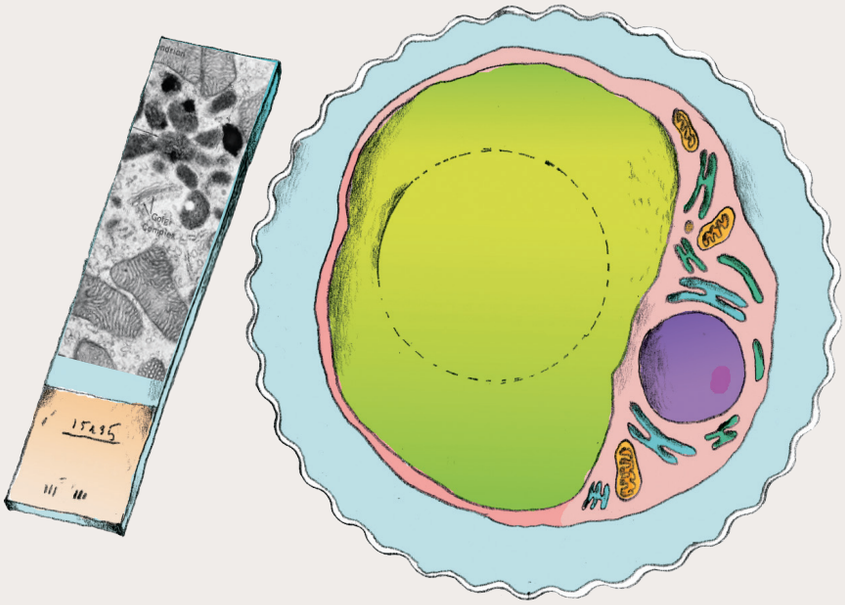
Genetic studies suggest that more than 7,000 Americans have CESD, but no one knows for sure. "Clinically, CESD can appear very similar to other forms of liver disease or to hypercholesterolemia," Dr. Kolodny says. "Thus it's likely that many people with the disease have been misdiagnosed." A severe form of CESD called Wolman's disease, he adds, occurs in infants, who generally do not survive past early childhood. The disease is especially common among Iranian Jews living in the New York area.

Dr. Kolodny advises physicians to consider a diagnosis of CESD when a patient presents with low HDL and high LDL levels, elevated levels of transaminase (a liver enzyme), and an enlarged liver. A blood test for acid lipase, available at NYU Langone and a handful of other medical centers, can confirm the diagnosis.

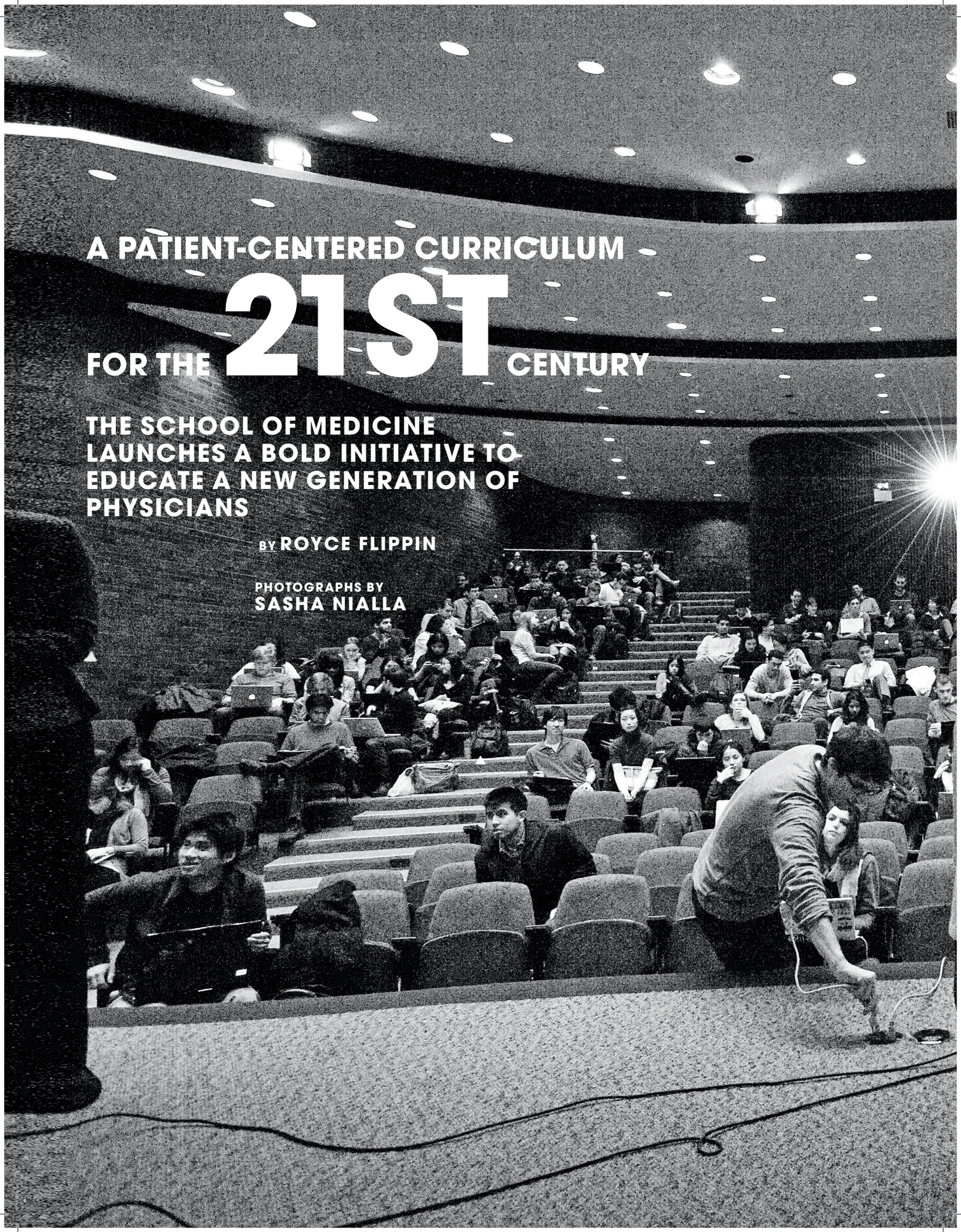
For more information about the clinical trial, physicians or patients can contact the Division of Neurogenetics at NYU Langone at (212) 263-8344. ●

—GARY GOLDENBERG

The cell's recycling centers, lysosomes, are the dark clusters in this image, which is adjacent to a drawing of a fat cell. More than 40 rare diseases are linked to malfunctioning lysosomes.



MICROGRAPH OF LYSOSOME: DON W. FAWCETT/PHOTO RESEARCHERS, INC.

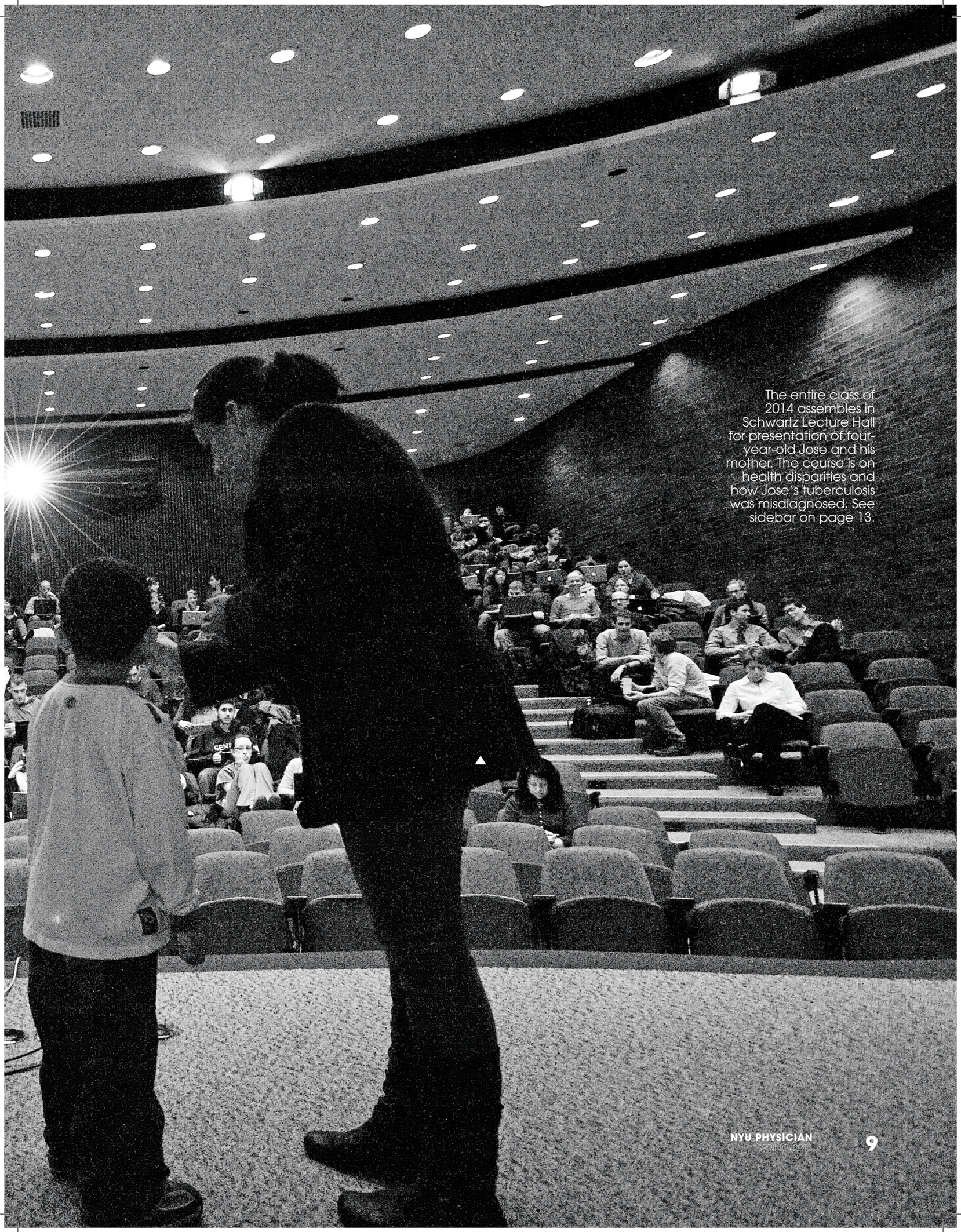


A PATIENT-CENTERED CURRICULUM FOR THE 21ST CENTURY

THE SCHOOL OF MEDICINE LAUNCHES A BOLD INITIATIVE TO EDUCATE A NEW GENERATION OF PHYSICIANS

BY ROYCE FLIPPIN

PHOTOGRAPHS BY SASHA NIALLA



The entire class of 2014 assembles in Schwartz Lecture Hall for presentation of four-year-old Jose and his mother. The course is on health disparities and how Jose's tuberculosis was misdiagnosed. See sidebar on page 13.

WHEN CARLOS MIRANDA CHOSE TO ATTEND NYU SCHOOL OF MEDICINE, HE BASED HIS DECISION ON THE EXPECTATION THAT HE WOULD HAVE EXTENSIVE CONTACT WITH PATIENTS EARLY IN HIS MEDICAL EDUCATION.

HIS REASONING WOULD HAVE BEEN UNIMAGINABLE TO PREVIOUS GENERATIONS OF MEDICAL STUDENTS, WHOSE EDUCATION WAS LARGELY BASED ON A MODEL FIRST OUTLINED BY ABRAHAM FLEXNER IN 1910.

Now, that "2 plus 2" format, in which students spend two years in the classroom studying physiology and disease, followed by two years of clinical apprenticeship, is being dramatically altered in the School of Medicine's new Curriculum for the 21st Century (C21 for short).

"We want to create a patient-centered curriculum, where students learn about medicine by studying real patients," says Steven Abramson, MD, vice dean for education, faculty and academic affairs. "This means that when you learn the cellular biology of diabetes, you'll also encounter a person struggling with daily insulin injections and see how that person is affected by the metabolic pathways you're studying."

The most notable change is that students begin meeting patients on their very first day of class, rather than in their third year of medical school and, most importantly, follow them throughout their medical training. At the same time, basic science is no longer taught in just the early years of medical school but is integrated across the entire four-year curriculum.

Of course, even in the traditional curriculum students weren't entirely cut off from patients early in their training; a few courses offered the chance to spend time with patients, but nowhere near the opportunities now available. In the new curriculum, students encounter patients with "Pillar" diseases such as diabetes and tuberculosis. Over time, the curriculum affords a progressive integration of basic science and clinical experience.

QUALITY TIME IN THE CLINIC AND THE CLASSROOM

Students today have ample opportunity to apply what they learn in their basic science courses to the patients they encounter in the clinic. Allowing such interaction is a profound change in the first years of medical education, and many aspiring young physicians welcome it.

"It makes an impact when you study something in pathology class, then learn to diagnose the same condition a few days later," says Miranda, who is in his second year of medical school. "While we were learning about diseases of the cardiovascular system, for example, we also had a session on how to conduct a cardiac exam. The next week, a group of us visited the intensive care unit to examine a patient who'd recently suffered a heart attack at his gym. It was interesting to see how different his situation was from the cases described in the textbooks—and it made the science we were studying a lot more relevant."

The new curriculum features a wealth of educational approaches made possible by the

Students have their laptops out during a Pillars class in Schwartz Lecture Hall.

C21 HIGHLIGHTS

Preclinical Years

- Program is 18 months.
- Core Principles in Medicine is organized by organ systems (cardiovascular, renal, GI, etc.).
- Progressive integration of basic science instruction is built around "Pillars" diseases (atherosclerosis, diabetes, colorectal cancer, tuberculosis).
- Practice of Medicine module, taken in parallel with above courses, instructs first- and second-year students in hands-on physical diagnosis and other clinical skills.
- Incoming students can enroll in four-year MD/master's degree program in Public Health with a concentration in global health (pending approval).
- Online basic science modules and team exercises engage small groups of medical and nursing students in joint clinical training.

Clinical Years

- Start six months earlier.
- Core clerkship year is divided into four 12-week blocks.
- Core clerkship year followed by a six-month period during which students can take additional selectives/electives, or begin their area of concentration.
- Core clerkship year also includes two 4-week blocks for selective/elective sessions of students' own choosing.
- During Year Three, students also declare an area of concentration, involving a 12-week research/clinical component, culminating in a scholarly project.
- During their final year, students continue pursuing their areas of concentration, participate in a critical care clerkship, and pursue a sub-internship in advanced medicine or advanced surgery.

school's pioneering information technology division, as computerized lecture archives, online learning modules, and other electronic tools have largely unshackled students from textbooks, microscopes, and classrooms. And it also embraces the broader concerns of modern medicine, emphasizing issues such as health disparities and medical care in developing nations. For students interested in delving further into these topics, C21 also offers an unprecedented chance to pursue elective courses and individualized research projects en route to their medical degrees.

AN INTEGRATED CURRICULUM

The changes in C21 reflect a national trend toward an integrated medical curriculum. Over the past decade, a spate of national reviews of medical education, including reports published by the Commonwealth Fund in 2002, the Institute of Medicine in 2003, the Association of American Medical Colleges in 2004, the Josiah Macy Jr. Foundation in 2009, and the Carnegie Foundation for the Advancement of Teaching in 2010, have advocated moving to a curriculum that vertically integrates learning basic science and building clinical skills over a four-year continuum.

"As our knowledge of biological science has expanded, it's become more disconnected from the clinical experience with patients," explains Dr. Abramson. "There's a growing consensus that this connection needs to be restored in order to give students a deeper understanding of modern science and its clinical applications."

In the new curriculum, the preclinical portion is 18 months—a shift that allows the clerkship experience to begin six months earlier. Disease "pillars" that incorporate case histories, clinical scenarios, and visits with patients form the core of pathophysiology courses. During this same 18-month period, students also take courses in the Practice of Medicine module, which provides instruction in bedside diagnosis and other clinical skills. (See The Right Place at the Right Time, page 14.)

The curriculum then provides a year of core clinical clerkships, followed by a six-month stretch in which students take elective and selective courses and declare an area of concentration, and a final year of clerkships and other activities. During the latter three stages, students continue studying basic science through online learning modules and targeted classes—ideally establishing a pattern of lifelong learning that will extend throughout their careers.

Students who sat on all the C21 planning committees helped shape the new curriculum. "The idea for selectives and concentrations originated with the students themselves," notes Melvin Rosenfeld, PhD, associate dean for curriculum and assistant professor of cell biology. "They indicated they wanted more flexibility to pursue individual areas of interest." Dr. Rosenfeld, Victoria Harnik, PhD, assistant professor of cell biology and director of education in the basic sciences, and Mary Ann Hopkins, MD, associate professor of surgery and director of education for the clinical sciences, played key roles in organizing the new curriculum.

CLINICAL EXPOSURE HELPS SOLIDIFY LEARNING

While the Class of 2014 is the first to follow the revised academic timetable, many of C21's elements

Faculty members who played key roles in designing the new curriculum, from left, Dr. Victoria Harnik, director of education In the basic sciences, Dr. Steven Abramson, vice dean for education, faculty and academic affairs, Dr. Mary Ann Hopkins, director of clinical education, and Dr. Melvin Rosenfeld, associate dean for curriculum.

THE CHANGES IN C21 REFLECT A NATIONAL TREND TOWARD AN INTEGRATED MEDICAL CURRICULUM.

were introduced with the Class of 2013. Students in both classes have experienced only the earliest stage of C21, but their reaction has been generally positive. "The early clinical exposure is definitely helping," says first-year student Keith Hemmert. "When we were studying congestive heart failure on the cellular level, we went into a clinic and listened to the heart and lungs of a patient with heart failure and learned what medications he was taking. Personally, it's much easier for me to memorize the side effects of cardiac medications when I see a patient who's actually on these drugs."

"There's a lot of emphasis on the human element," agrees Fabio Sagebin, a second-year student who is taking Introduction to Bedside Diagnosis, a component of Practice of Medicine, under the tutelage of Beno Oppenheimer, MD, director of the Surgical Intensive Care Unit at the Manhattan Veterans Affairs Medical Center and assistant professor of medicine. "During one class, while Dr. Oppenheimer was doing a neurological exam, a patient in the next bed was struggling to eat—he couldn't physically bring his fork to his mouth," Sagebin says. "Dr. Oppenheimer explained, 'This is one way how patients may become undernourished in the hospital.' I went over and helped him eat his dinner. It was a very fulfilling experience, and it showed me there are many ways to help in medicine."

The shortened time frame for basic science in the C21 format raised concerns that students might not develop an adequate grasp of scientific principles, but these concerns have been mollified, at least in part. "I was skeptical going in, but I've been impressed," says Adam Skolnick, MD, assistant professor of medicine, who teaches heart and vascular function. "We used to focus only on the cell and tissue level in the first year. Now we progress from that level to global health in a week's time," he says. "From my perspective, it's giving students a more sophisticated understanding of the science. They're asking questions they might not have asked before, about things like the effect of ion channel mutations on a patient with heart failure or how thrombosis leading to heart attack occurs on the molecular level."

As current second-year students prepare to enter another phase of the revised curriculum, C21 remains a work in progress: The menus of selectives and concentrations offered are still being finalized, and the School of Medicine is also working to develop new tools for assessing students' clinical skills as they make their way through the new format. While some faculty report that the new curriculum appears to be exceeding expectations, others caution that its true impact won't be clear until the Class of 2014—the first class to experience every aspect of C21—has graduated, at which time the school can begin reviewing what's working and what isn't.

In the meantime, medical students at NYU are clearly energized by the new approach. "Whenever students are exposed to patients, they become much more excited," says Kathleen Hanley, MD, clinical assistant professor of medicine and director of the Practice of Medicine module. "Ultimately, that's why we're all here. This new approach has been very challenging. But I think the students are working harder than ever before, and enjoying it." ●

A Critical Part of the New Curriculum: Health Disparities

Sitting onstage, four-year-old Jose (not his real name) drew busily on a pad of paper, paying no attention to the entire first-year class of medical students listening intently as his mother spoke in Spanish with Mona Rigaud, MD, associate professor of pediatrics. While Dr. Rigaud translated, Jose's mother described how he had been diagnosed with tuberculosis the previous year, and the various missteps that occurred before he came under Dr. Rigaud's care.

Jose and his mother were part of the School of Medicine's Pillars class on tuberculosis. (The new C21 curriculum is built around diseases such as TB and diabetes, called Pillars.) His mother, who had tested positive for latent TB several years ago, was born in Mexico. As Ellie Carmody, MD, clinical instructor in medicine, explained in her follow-up presentation on TB's epidemiology, the highest burden of TB in the U.S. falls on recent immigrants, with arrivals from Mexico topping the list.

When one group of people is at heightened risk for a disease due to underlying social or economic conditions, this is known as a "health disparity." Understanding such disparities is crucial: They can guide diagnosis (if Jose's first doctors had been more aware of TB's link to recent immigration, his infection may have been caught sooner) and reveal public health problems. One source of TB infection, for example, is *Mycobacterium bovis*, transmitted through the consumption of unpasteurized dairy products produced outside the U.S. Jose's mother noted that her son sometimes ate unpasteurized cheese sent by relatives in Mexico. Health disparities may also reflect inequalities in health care delivery. In another segment of the TB Pillar seminar, Eric Leibert, MD, assistant professor of medicine, explained how lack of disease-monitoring technology was contributing to the spread of drug-resistant tuberculosis in resource-limited countries.

Teaching students to view illness through the lens of health disparities is central to the new C21 curriculum. "In the past, health disparities were treated as a special topic," notes Mekbib Gemeda, MA, assistant dean for diversity affairs. "C21 integrates these concepts into every condition that students learn about." When studying diabetes, for example, students will examine its increased prevalence among Hispanic- and African-Americans, then explore possible reasons for this disparity.

Besides weaving health disparities into the core curriculum, C21 lets students study the issue in-depth during their third and fourth years as a selective course or an area of concentration. "Both selectives and concentrations will offer specific programs on health disparities," says Mary Ann Hopkins, MD, associate professor of surgery and director of education for the clinical sciences. Students can also opt for other topics that incorporate health disparity issues, such as international or population health, or clinical research into disease epidemiology.

Students particularly interested in the subject can also pursue a master's degree in public or global health. "We want students to delve deeply into these topics," says Steven Abramson, MD, vice dean for education, faculty, and academic affairs. "Not only will this stimulate new directions in their careers, but it will prepare them to become leaders in these areas down the road."

THE RIGHT PLACE AT

Dr. Fritz Francois (left) explains how the esophagus can become inflamed to Xingchen Mai, Class of 2014. The patient in this picture was undergoing an endoscopy in Bellevue Hospital's colonoscopy suite.

THE RIGHT TIME

FIRST-YEAR MEDICAL STUDENTS ARE NOW INTERVIEWING PATIENTS AND PRACTICING CLINICAL SKILLS

BY GARY GOLDENBERG

PHOTOGRAPHS BY RENÉ PEREZ

THE INK ON XINGCHEN MAI'S NYU SCHOOL OF MEDICINE ACCEPTANCE LETTER WAS BARELY DRY WHEN HE STARTED VISITING BELLEVUE HOSPITAL'S 10TH FLOOR OUTPATIENT ENDOSCOPY SUITE TO GET A FIRST-HAND LOOK AT THE PRACTICE OF MEDICINE.

Soon he was interviewing patients, practicing clinical skills, and observing procedures.

Although it might seem like Xingchen (Xing for short), Class of '14, was getting a little ahead of himself, he was doing exactly what is now expected of every first-year NYU medical student. In 2010 the School of Medicine launched an early clinical immersion program in which aspiring doctors are paired with practicing physicians and—in an innovative twist—asked to follow a small group of patients over the course of a year, wherever their illnesses may take them.

"In addition to shadowing physicians, which our students have done in the past, they're also shadowing patients," says Jennifer G. Adams, MD ('99), clinical instructor in medicine and director of the new program, known as PLACE, for Patient-based Longitudinal Ambulatory Clinical Experience.

"The idea is for students to see the evolution of disease and the resolution of disease, rather than seeing a patient just once," Dr. Adams says. "By following patients over time, they will get a much more comprehensive understanding of the disease process, the health-care system, and the psychosocial aspects of patient care."

DOCTORING 101

PLACE has captured the attention of prospective students. "One of the things that attracted me to NYU was that I would get to the wards so early," says Xing on a cold mid-February afternoon at Bellevue, his second monthly PLACE session. "When you're in class, learning the basic sciences, medical school can seem like a continuation of your undergraduate studies. But not when you're in PLACE. This is doctoring 101."

Xing's first patient of the day is Kevin (not his real name), a 48-year-old man with a long-standing HIV infection, complaining of gastrointestinal distress. Today he's scheduled for a colonoscopy, which is to be performed by Xing's preceptor, Fritz Francois, MD ('97), assistant professor of medicine and assistant dean for academic affairs and diversity. Following Dr. Francois' lead, Xing dons a surgical gown, gloves, and facemask so he can observe the procedure from the bedside. The test is inconclusive; there is more medical sleuthing to be done.

Back in the recovery area, Xing begins delving into Kevin's medical history. "In the last few days, what two symptoms have bothered you the most?" Xing asks, calling on interviewing skills he learned in class in recent weeks. "What medications are you taking?" "Has your stress level changed in recent months?" "Tell me about your parents' health." If the budding physician is uncomfortable in his new role, it doesn't show.

After a half-hour, Xing gingerly presses his stethoscope to the patient's chest, listening carefully for abnormal heart sounds, fulfilling the goal of this month's PLACE session. In each session students are expected to practice at least one new skill they've learned in weekly seminars in the Practice of Medicine course, such as taking a blood pressure reading, conducting a medical interview, or practicing communication skills—part of a curriculum-wide effort to better integrate classroom and clinical learning in the preclerkship years.

Xing's about to wrap things up when Dr. Francois, one of 94 PLACE preceptors, drops by to demonstrate how to palpate an abdomen, explaining how differences in the pitch of sounds emanating from the intestines can help reveal the diagnosis. Xing gives it a try.

"What else did you notice about the patient?" Dr. Francois asks.

"He's thin and frail," Xing notes.

"Good," Dr. Francois responds. "Even though you're doing an abdominal exam, you're always looking for signs of other abnormalities. You look at the skin, the sclera, the dentition. Whenever you talk with a patient, you can use that as an opportunity to assess his speech, his movement, his ability to interact."

LEARNING HOW TO GAIN THE TRUST OF PATIENTS

Kevin's case won't be solved today—disappointing news for the patient, but good news for Xing. He has found a new patient to follow, which does not happen every session since it can't be predicted what patients will come in on a given day or whether they will agree to participate.

"From here," Dr. Francois says, "Xing can examine the biopsy tissue with the pathologist, if he's interested, and then he can follow the patient back to his primary care doctor. Over the next few weeks or months, he'll get to see all the pieces of the clinical picture."

Dr. Francois has no illusions about transforming first-year students into wizened clinicians overnight. "It's not like Xing's going to know all the diagnoses and treatments," he

First-year medical student Xingchen Mai performs a preliminary examination of a patient under the watchful eye of Dr. Francois. As part of the PLACE program, students follow patients to gain a more comprehensive understanding of the disease process, the health-care system, and the psychosocial aspects of patient care.

acknowledges. "This is about developing a level of comfort with assessing patients through history and physical examination. Doctors must quickly gain the trust of their patients, and a critical part of being a good doctor is about putting patients at ease, regardless of gender, language, religion, or age. This is a skill that can be learned."

When asked whether he had this type of experience as a novice student, Dr. Francois rolls his eyes. "I wish," he says with a laugh. "It was almost like it was taboo to be on the wards in the first year of school. The very first time I interviewed and examined a patient extensively was as a third-year clerk. I was terrified. I got through it all right, but I felt like I had a lot of catching up to do." (Before PLACE, two programs offered first-year students an opportunity to have some contact with patients: The Patient Narrative, introduced in the early 1990s, and Physician, Patient, and Society, which began in 2001. Dr. Francois graduated from NYU School of Medicine before these programs were offered.)

Dr. Adams also sees PLACE as an early opportunity for students to practice how to be humanistic caregivers. "Empathy and compassion are instrumental to caring for patients," she says. "Some students have an innate ability to manage these complex emotions and behaviors, but not others. But everyone can get better at them. I interview patients daily; it's second nature to me. But I still tape my patient interviews on occasion to reflect on how I'm interacting with patients and how I can do it better."

TEACHABLE MOMENTS

In the Bellevue endoscopy suite, the student and preceptor gown up once again, this time to perform a colonoscopy on a 50-year-old Hispanic woman. Colorectal cancer is one of the central pillars of the medical school's new curriculum. As the test proceeds, Xing, who has already seen a half-dozen colonoscopies, points out various anatomical landmarks, such as the opening to the appendix and the triangular configuration that signals the start of the transverse colon.

"These structures look very different in a cadaver," says Dr. Francois, as he surveys the twists and turns of the large intestine. "Seeing the anatomy of a living patient reminds you of why you're in medical school."

"SOMEWHERE ALONG THE WAY, WE MOVED TOO FAR AWAY FROM THE HANDS-ON AND HUMANISTIC ELEMENTS OF MEDICINE. THAT'S NOT THE BEST MODEL FOR LEARNING. NOTHING OPENS YOUR EYES LIKE SEEING IT FIRSTHAND."

When Dr. Francois mentions that he's found an abnormality, Xing immediately points out two tiny, almost invisible polyps on the video monitor. "He's got a good eye," says Dr. Francois. "The first

Tze-Jung Su, MD, supervises medical student Di Zhou as she examines a patient at Gouverneur Healthcare Services, on New York's Lower East Side, as part of the new curriculum's PLACE program.

time I pointed out a polyp, he said, 'What are you talking about?'"

Loath to pass up a teachable moment, Dr. Francois describes how the location as well as appearance of polyps can vary dramatically from one ethnic group to another—one of many mini-lessons in patient diversity that Xing is certain to learn in PLACE. The effect is intentional. Some PLACE sessions are based in public health facilities in New York City, such as Baruch Family Health Center, Gouverneur Healthcare Services, and the Charles B. Wang Community Health Center, to expose students to as wide a range of patients as possible. In addition, students shadow physicians and patients in private practices.

IN EACH SESSION, STUDENTS ARE EXPECTED TO PRACTICE AT LEAST ONE NEW SKILL...SUCH AS TAKING A BLOOD PRESSURE READING, CONDUCTING A MEDICAL INTERVIEW, OR PRACTICING COMMUNICATIONS SKILLS...

For Xing, it's been a productive afternoon, but the session isn't officially over. Within 24 hours, he will have to write up his cases on a confidential, encrypted website, offering him opportunities to reflect on his day's work and to query his preceptor. The patient logs also allow Dr. Francois to keep tabs on his students' progress.

EMPHASIZING THE HUMANISTIC ELEMENTS OF MEDICINE

As Dr. Francois sees it, PLACE is a much-needed corrective in medical education. In the century since the 1910 Flexner report, medical schools have put more and more emphasis on a standardized diet of basic science in the first half of the curriculum, delaying significant contact with patients until the third year. "Standardization was necessary," he elaborates, "but somewhere along the way, we moved too far away from the hands-on and humanistic elements of medicine. That's not the best model for learning. Nothing opens your eyes like seeing it firsthand. If a picture is worth a thousand words, then how much is the interaction with a patient worth over the course of his or her treatment?"

Of course, only time will tell. So far, the feedback from students and preceptors has been overwhelmingly positive, Dr Adams says. "We'll have a better sense of how PLACE is working in a couple of years, when the students start their clerkships. As we continue to integrate PLACE with Practice of Medcine, those clinical experiences should become even more rewarding."

In the meantime, Xing is looking forward to his next PLACE session. "I've learned so much talking with patients and interacting with the doctors and nurses," he says. "It's an amazing experience." ●

NYU3T
The new curriculum teams student doctors and nurses.

Emily Odermatt, 19, a second-year nursing student, and Darien Sutton-Ramsey, 22, a first-year medical student, might one day have expected to encounter each other performing their roles in an operating room or attending to a patient in an exam room. Instead, they're meeting each other in a new one-year combined curriculum designed to teach future doctors and nurses to work together before they ever lay hands on a patient.

"It's not unusual for students to be unaware of the other person's role," says Terry Fulmer, PhD, the Erline Perkins McGriff Professor and Dean of the College of Nursing, who created the new curriculum with Marc Triola, MD ('98), director of the Division of Educational Informatics. "We believe that by giving them this important new content in the curriculum," says Dr. Fulmer, "there will be better communication and, ultimately, improved patient care outcomes when they practice."

Launched February 2, 2011, NYU3T is shorthand for "Teaching, Technology & Teamwork," which for the first time brings together 332 NYU medical and nursing students in a joint learning setting. The project is funded through a four-year grant from the Josiah Macy Jr. Foundation.

"The students love it," Dr. Triola says. Professional collaboration across disciplines is "increasingly becoming not only the norm, but a necessity."

And good communication within those collaborations aims to improve patient care, notes Jennifer G. Adams, MD ('99), clinical instructor in medicine, a member of the team that developed the curriculum. The team included Fritz Francois, MD ('97), assistant professor of medicine, Adina Kalet, MD, associate professor of medicine and surgery, Sabrina Lee and So-Young Oh, of the Division of Educational Informatics, and Maja Djukic, PhD, RN, assistant professor at the College of Nursing.

NYU medical and nursing students gather around a bed with a simulated patient to learn communication and team-building skills they can draw upon later as professionals.

"Many medical errors are the result of poor communication among team members," Dr. Adams says. "For optimal patient care, you want a good team, so it's important to start early and emphasize the importance of communication. We really think it will make a difference."

Now in their first semester of the program, the students watch video vignettes online and listen to dialogue about them with their team members. Nursing student Odermatt says she recently learned a new perspective from a team exercise involving a vignette of a physician who excused himself to take a phone call during a patient consultation with colleagues.

When the student teams were asked to respond to the pros and cons of the vignette, "one of the medical students had written that he thought it was rude of the doctor to take a phone call in the middle of the meeting," she says. "I had been thinking that everyone gets pulled in every direction as a natural course because of patient demands. But the medical student who noticed the disruption was more aware of the need for time management skills. And he was right."

Next semester the students will focus on skills practice, managing virtual "cases" online and in a simulation lab. "They'll make decisions and order medications as a team," Dr. Triola says. "There's also an exercise with full-body robotic humans simulating acutely ill patients. Faculty members play the role of attending physicians, so that we can see how they're using these skills."

During clinical assignments, both nursing and medical students shadow professionals in other disciplines. Odermatt says the process has already helped her communicate better. "I'm more concise because I can determine what information is pertinent and to whom."

Building relationships with coworkers is key for her team member, medical student Sutton-Ramsey. "What I'm really learning is to gain a respect and understanding of everyone's role. I thought it was just, 'you do your job, I'll do mine.' It's inspired me to see how, for all of these people, what they all have in common is treating the patient."

–Aubin Tyler

TEACHING AT THE BEDSIDE

LEARNING TO TAKE HISTORIES AND DO PHYSICAL EXAMS THROUGH THE MERRIN FELLOWSHIP PROGRAM BY GAY DALY

IN 2000 ADINA KALET, MD, became the youngest of the firm chiefs, a highly select group of eight faculty members who oversee medical education at NYU Langone Medical Center. When they met each month to talk about issues in medical education, she recalls, one subject would come up again and again. "These were some of the most respected clinicians in the hospital," Dr. Kalet says, "and they had this terrible grief about the loss of bedside teaching."

Over the last decade, Dr. Kalet, who is now associate professor of medicine and surgery and co-director of the Program for Medical Education, Innovation, and Research, has gained a better understanding of the source of their feelings. Reliance on medical technology, a trend that started in the 1960s, was superseding the traditional skills they valued, she says. Increasingly, diagnoses were being made solely on the basis of test results, and doctors were devoting more of their time to mastering complicated technology at the expense of doing bedside exams. Consequently an older generation of physicians encountered younger doctors who had never learned how to talk with patients or do comprehensive physical exams. And the older faculty members were not the only ones concerned about this. "There was a lot of shame among the junior people," she says, "because they knew they weren't as well trained as their senior colleagues."

The problem was how to bridge this painful gulf. One of the firm chiefs, Mitchell Charap, MD, now the Abraham Sunshine Associate Professor of Clinical Medicine, had a patient named Ed Merrin, a retired dealer in antiquities, who keenly shared this concern and offered to put up money to address it. Since 2003, Merrin's support has helped Drs. Charap and Kalet create the Merrin Bedside Teaching Program, making fellowships available to young faculty members to hone their bedside teaching skills.

In the first year, fellows seek out senior doctors to mentor them; in the second year, fellows use what they have learned to teach other attendings, residents, and medical students the nuances of taking histories and examining patients, supporting the new curriculum's focus on patient-centered learning.

BUILDING TRUST

Merrin Fellows like Richard E. Greene, MD, teach at the bedside and in the consulting room. Dr. Greene, assistant professor of medicine and assistant director of the Primary Care Residency Program, works with third-year residents in his office at Gouverneur Hospital, a public hospital on the Lower East Side. One day in February Juliana Eng, MD, came into his office to discuss a patient. "I'm completely perplexed by how debilitated this patient is," Dr. Eng said. "She's only 48, but she's using a cane, and she gasps even trying to get up from a chair." Despite two decades of painful osteoarthritis, the woman had always been active, even doing martial arts and cycling, but since

PHOTOGRAPHY: MIKE WEYMOUTH, WEYMOUTH DESIGN

ILLUSTRATION BY LAURA CARLIN

November her pain had become so severe she sometimes could not get out of bed.

A thorough young resident, Dr. Eng has considered every possible diagnosis, many of them dire. After she describes her exam of the patient, Dr. Greene narrows the field. Knowing the osteoarthritis is far enough advanced to cause this degree of pain, he explains to Dr. Eng that their job is to help the patient accept the lifelong battle she faces.

When they see the patient, her story pours out. She has spent most of her savings on a knee operation that failed, and she has no medical insurance. And now she is so physically unstable she can't even look for a job.

Dr. Greene suggests a cortisone injection, which she angrily refuses. The intensity of the woman's fear resonates with Dr. Greene, and he backs off. "This isn't just about today," Dr. Greene tells the patient. "We will be with you for as long as you need us."

Then Dr. Greene leaves so that Dr. Eng can finish the consult by herself. Gently she suggests that the patient reconsider the injection, adding, "If I could wish one thing for you, it would be that you could go back to your martial arts." That spark of understanding lights a small fire of hope in the patient, who reverses herself and says firmly, "OK, let's do it, right now." Dr. Eng says Dr. Greene's guidance has helped her to trust her own instincts and judgment.

A DIAGNOSIS MADE WITH EYES, EARS, HANDS, AND STETHOSCOPE

During his first year as a Merrin Fellow, Michael Janjigian, MD, assistant professor and director of the Physician Assistant Program, sought out the eminent Martin Kahn, MD, the Joel E. and Joan L. Smilow Professor of Cardiology, as his mentor.

Now in his second year, Dr. Janjigian works with Dr. Kahn, offering bedside rounds demonstrating how to make a diagnosis using only eyes, ears, hands, and stethoscope. When rounding begins, Dr. Janjigian knows the patient's history, but all Dr. Kahn knows is that the patient, in his 40s, had heart surgery in Caracas when he was 11 and now has symptoms of heart failure.

Dr. Kahn spends an hour examining the man, describing each observation and noting the possibilities it raises in his mind, so those around the bedside can hear his thought process unfolding. In that hour he relates what he sees: the jugular vein in the neck pulsing too hard with each heartbeat, which indicates the tricuspid valve connecting the right atrium and ventricle is malfunctioning; the dusky color of the legs that suggests low blood oxygen levels; an asymmetrical diaphragm, perhaps the result of surgery for a congenital defect.

Dr. Kahn discusses what he can feel: a greatly enlarged right ventricle; he posits that the faulty tricuspid valve may have been forcing it to work too hard to pump blood. He feels the pulsing of the pulmonary artery, suggesting that many years of high pressure have expanded it.

Dr. Kahn describes hearing through the stethoscope the loud closing of the pulmonary valve, reinforcing the thought that it's closing under the force of very high pressure arising from the left side of the heart. Then he mentions splitting, and Dr. Janjigian notices confused faces around the bed. He becomes the teacher, tactfully asking Dr. Kahn to define splitting—the sequence of sounds signaling that the closing of the aortic and pulmonary valves is out of sync.

At one point Dr. Kahn speculates about the childhood surgery. "I wish I knew more about pediatric cardiology," he says, a frank statement that assures the younger doctors there is no shame in admitting what you don't know.

Dr. Adina Kalet (left), co-director of the Program for Medical Education, Innovation, and Research, with Dr. Katherine Hochman.

Then Dr. Kahn detects a sharp sound that concludes the diagnosis: metal closing on metal—the sign that a prosthetic valve was used to replace the mitral valve connecting left atrium and ventricle.

Dr. Janjigian confirms what Dr. Kahn has deduced. Rheumatic fever at age 10 had necessitated a mitral valve replacement. An adult-size valve should eventually have replaced that narrow valve, but it didn't, which precipitated a cascade of events that has damaged heart and lungs. Without an expensive echocardiogram or even an EKG, Dr. Kahn has identified the cause of the patient's heart failure. After tests confirmed the diagnosis, the mitral valve was replaced and the patient is doing well.

"These were some of the most respected clinicians in the hospital," Dr. Kalet says, "and they had this terrible grief about the loss of bedside teaching."

Since starting to work with Dr. Kahn, "my level of comfort at the bedside has gone up dramatically," Dr. Janjigian says. "I'm much less reliant on diagnostic tests, and I get much more out of the interview with the patient and the physical exam than I used to."

Dr. Janjigian says many of the young attending physicians who come to these rounds agree. "We really treasure these encounters with Dr. Kahn because there aren't many doctors like him left." ●

OVER–TURNING THE STATUS QUO

POWERFUL NEW TECHNOLOGIES LIKE **VIRTUAL MICROSCOPY** AND **ADVANCED PODCASTING** ARE CHANGING WHERE AND WHEN STUDENTS CAN LEARN.

BY *BRYN NELSON*

ILLUSTRATION BY JEFFREY DECOSTER

DURING A SKI TRIP IN EARLY 2010, NYU MEDICAL STUDENT FARES SAMRA SLIPPED WHILE ATTEMPTING A SNOWBOARDING TRICK, DISLOCATING AND FRACTURING HIS LEFT ELBOW. SAMRA SPENT THE NEXT WEEK RECOVERING AT HIS PARENTS' HOME. BUT WITH PODCASTS OF EVERY lecture available online, he easily kept pace with his course work until he returned to school. "I was recuperating in New Jersey, but theoretically I could have been in Australia. It wouldn't have made a difference," he says.

Powerful new technologies like advanced podcasting, virtual microscopy, and realistic three-dimensional graphics are liberating medical education from long-standing constraints on where and when students can learn. The traditional lecture, educators are discovering, is gradually being deposed as the principal format for dispensing knowledge.

By properly channeling the power of "disruptive technologies" that can overturn the status quo, reformers like Marc Triola, MD ('98), director of the Division of Educational Informatics, see a wealth of possibilities for reshaping and enhancing medical education. "In a paradoxical way, I think these computer-based tools will really create more opportunities for faculty and student interaction, and interaction that is of a higher and more engaging quality," Dr. Triola says.

Human contact, mentoring, and hands-on experience, after all, are still considered vital to educating students. As director of one of the largest educational informatics laboratories in the nation, Dr. Triola is aiming to reinforce essential interactions with a suite of cutting-edge tools that adapt to the needs of individual learners and teachers.

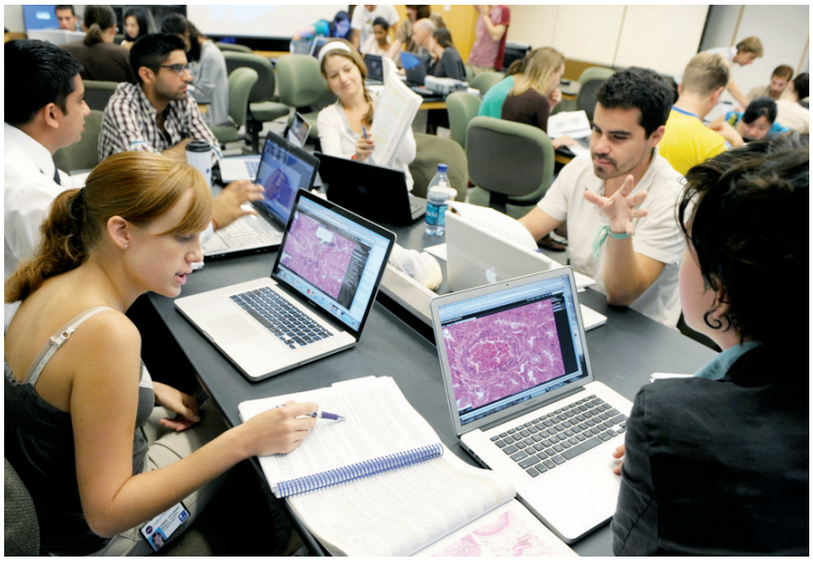
Once teachers begin delivering basic knowledge via podcasts, for example, a lecture hall where students learn passively by taking notes might become a more dynamic arena for group discussions or a cancer expert's case presentation. Likewise a lab filled with solitary students examining cells under microscopes can evolve into an online community where viewers use virtual microscopes to ask questions, collaborate, and share expertise.

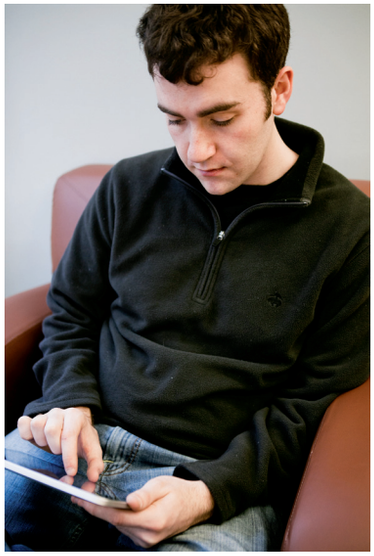
"These technologies and computer system instructions are merely the means to an end of newer ways of teaching," Dr. Triola says. "One of the core principles is that these tools can empower both students and faculty to have more direct control over their educational content, how they access it, when and where they access it, and how they organize it."

Martin Nachbar, MD, director emeritus of the Division of Educational Informatics and Dr. Triola's longtime mentor, says the disruptive technologies are forcing educators to reconsider their role in the classroom. "Is the best use of faculty time to deliver information or to hone the critical thinking, problem-solving, and decision-making skills needed to be good doctors?" he asks.

Dr. Nachbar, a past recipient of NYU's Distinguished

(Bottom left) In the School of Medicine's microscopy lab today, microscopes have been replaced by laptops that display interactive images of the School's Virtual Microscope. (Right) Medical student Brian Dibble in Vilcek Residence Hall accesses the day's course work on his tablet computer via ALEX online portal that stores all lesson plans.





PHOTOGRAPHY: BOTTOM LEFT: JON SIMON, RIGHT: ELIZABETH WEINBERG
PHOTOGRAPH: TOP RIGHT: SASHA NIALLA

Dr. Marc Triola, director of the Division of Educational Informatics, which developed many of the innovations in educational technology being used in the new curriculum.

Teaching Medal and the Masters Award for career achievement in education, began the effort to apply computer technology to the NYU School of Medicine curriculum in 1987. Nearly a quarter-century later, he says, the new era of "accelerated, constant change" is challenging any educational philosophy that is set in its ways.

THE VIRTUAL MICROSCOPE

One of the most successful challenges to the business-as-usual model has been the NYU-built Virtual Microscope, a project Dr. Triola says his team began on a whim. After only six months of use in the School's histology and pathology labs, the software had upended more than a century's worth of traditional microscope-based instruction.

To create the online tool, Dr. Triola's group experimented with the engine that powers the familiar Google Maps application. The result was a powerful program that allows students and instructors to navigate through magnified images of cells, tissues, and organs the same way they would zoom in and out or pan to explore a neighborhood, city, and state.

Mel Rosenfeld, PhD, associate dean of curriculum, content director for histology, and assistant professor of cell biology, says the technology has fundamentally changed the logistics and scope of education at NYU. "I no longer have to worry about servicing 330 microscopes every year," he says. Nor does he concern himself with broken microscope slides, tissue dyes that fade over time, or instructors who don't know which slides students have seen.

"From a logistics standpoint, it's an incredible time saver," Dr. Rosenfeld says. "It's also allowed us to begin creating a digitized slide collection with the best examples of the basic tissues and organs that we have." NYU has released the program as open-source software, meaning that other medical schools can upload and share their collections and give students a richer compilation of slides to review. Both students and instructors can tag points of interest, just as users of Google Maps can flag landmarks. And like the user-generated news sites Reddit and Digg, Virtual Microscope viewers can comment and even vote on the relevance of added tags. "It's a great way to collaboratively learn, which we've never really been able to do before," Dr. Rosenfeld says.

Medical student Tara Russell says studying with her classmates would be far more difficult if everyone were forced to view a different slide or were limited to a few hours of lab time. Last year, she and several other classmates loaded the Virtual Microscope program onto a projector in a conference room and reviewed slides together. Other students connected their laptops to big-screen TVs and hosted group study sessions before exams. "Because it's a virtual world now, students can be looking at all of this material anytime they want," Dr. Rosenfeld says, "which for medical students is usually 2, 3, or 4 in the morning."

"THESE TECHNOLOGIES AND COMPUTER SYSTEM INSTRUCTIONS ARE MERELY THE MEANS TO AN END OF NEWER WAYS OF TEACHING..."

INNOVATIVE PODCASTS OF LECTURES

The arrival of podcasts accessible through a secure site within Apple's iTunes U has similarly shifted the focus away from the traditional 9 a.m. lecture. Every podcast is now available about 30 to 45 minutes after the original lecture ends. And unlike podcasts that record only sound, NYU uses a process called screen capture that lets students hear the talk, see the presentation, and track what the lecturer is pointing out on every slide.

"I actually used to go to lectures all the time, and now I go probably 15 to 20 percent of the time," Russell says. "But a lot of the time, I just find that it's easier for me to do it at my own pace." For her, that means listening to an hour-long podcast at 1.5 times the normal speed and using the remaining 20 minutes to organize and review her notes.

Dr. Triola says faculty members fretted that few students would bother showing up to lectures at all. Although there's been an overall dip in attendance, he says that the heavy volume of podcast downloads and positive feedback by students suggest that they are avid users of the recorded material, sometimes reviewing the same lecture many times. "It's like a VCR in a way," Dr. Rosenfeld adds. "It's not that you're not watching it, it's just that you've time-shifted it."

For Samra, that latitude was invaluable while he recovered from his broken elbow. During his frequent study sessions in the New York Public Library, he routinely listens to lectures at twice the normal speed. Other students regularly catch podcasts while going home for the weekend, commuting to school, or lying in bed. "Having the flexibility that podcasting allows is definitely an asset to our curriculum," Samra says. It's an advantage that he has emphasized while giving tours to other prospective medical students.

Dr. Triola says instructors are beginning to prerecord their lectures or refer their students to talks from previous years. Class time is increasingly seen as a chance to explore new ways of teaching by hosting group discussions or presenting medical cases.

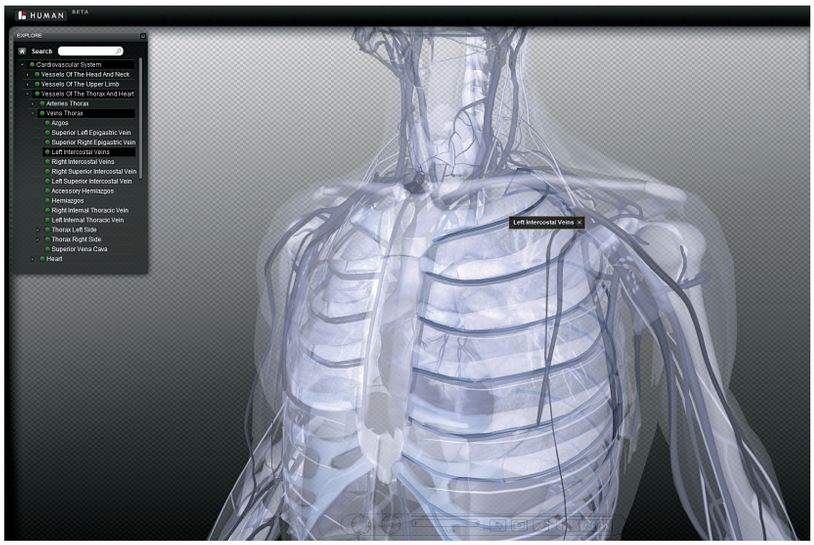
THE BIODIGITAL HUMAN

Dr. Triola concedes that not everyone is sold on the value of new technology, especially its potential for simulated dissections on a high-resolution, three-dimensional virtual model called the BioDigital Human. "Our goal is absolutely not to replace human cadaveric dissection," he emphasizes. "We think that's a terrific, amazing experience, and it's one that we want to use this technology simply to potentiate, not to replace."

The BioDigital Human, he says, will allow students to practice virtual dissections before trying out their technique on

Medical student Keith Hemmert wears 3-D glasses and uses the BioDigital Human, displayed on his laptop, to help guide his dissection of a cadaver in the anatomy lab.

This BioDigital Human image of the cardiovascular system helps students see underlying tissues and structures; the model is the result of a collaboration between the School of Medicine and BioDigital Systems.



"IT'S A GREAT WAY TO COLLABORATIVELY LEARN, WHICH WE'VE NEVER REALLY BEEN ABLE TO DO BEFORE."

cadavers. The technology can simulate anatomical variations, make tissue transparent to help students see underlying structures, and even integrate the teaching of radiology by showing what an MRI or CT scan looks like within the three-dimensional anatomy. The software, like the Virtual Microscope and lecture podcasts, is iPad compatible, and Dr. Triola's group is even creating graphics that can be viewed with 3-D glasses.

The use of virtual patients, Dr. Nachbar says, can fill gaps in medical knowledge and give students the chance to practice decision making. "You can deliberately make mistakes on virtual patients to see the consequences so that you prepare yourself for the real-life situation," he says.

To house the growing suite of learning tools, along with the entire medical school curriculum, the Division of Educational Informatics has created a central online portal. Known as ALEX, the system allows instructors to add or subtract from stored lesson plans, while students can review PowerPoint presentations from previous years or jump ahead to preview more advanced concepts.

Here, too, the medical students have begun exploiting the technology's potential for group learning. A student page within ALEX, for example, lets them exchange resources for specific courses, like posting a list of drugs that they'll need to know for a test.

What impact will all this innovation have on the quality of medical education? Until recently, Dr. Nachbar says, medical schools did little to assess the effectiveness of their methods. Now, he says, the central question is shifting from, "Have students acquired the knowledge?" to the more important consideration, "Can they apply the knowledge?"

NYU's education data warehouse may help supply the answer. The online warehouse is gathering information about students' interactions with each tool, a kind of "educational epidemiology." Dr. Triola hopes to better understand how the interactions affect performance over time—and even how their patients fare over the same period. The goal will be to link the data warehouse to NYU Langone's clinical data warehouse, he says, "so we can truly tie clinical patient outcomes with our educational and curricular needs." Technology, then, may help teachers focus on what really matters: not when or where their students learn, but whether they've mastered the skills needed to become excellent doctors. ●

A State-of-the-Art Simulation Center

● The New York Simulation Center for Health Sciences, a 25,000-square-foot facility to be located in Bellevue Hospital, will open in September. The new center will feature the most advanced operating rooms, life support technology, and even a critical care unit to train students, residents, and medical staff on high-tech mannequins. NYU Langone Medical Center and the City University of New York (CUNY) collaborated on the project.

CUNY's lead institution on the medical simulation center is the Borough of Manhattan Community College, which received $21 million in state and city funds to construct the facility. NYU Langone is coordinating the design and construction process and will manage and provide funding for the center's operation. Thomas Riles, MD, the Frank C. Spencer Professor of Surgery and associate dean for medical education and technology, will be the center's director.

The facility is especially well suited for training individuals and teams to handle high-risk or catastrophic events, and it is expected that emergency management workers will also use it. The center will be able to replicate a wide range of scenarios from standard patient care and routine procedures to clinical and surgical emergencies and multiple-patient triage in a disaster situation.

PHOTOGRAPHY: ELIZABETH WEINBERG

To Grasp a Handle, Open a Jar, Hold a Fork

A surgeon restores the hand of a young Iraqi woman injured by a terrorist bomb.

NOORA AL-SARIAA, 27, a striking young woman with dark, shoulder-length hair, brown eyes, and a ready laugh, struggles a bit with English. So she sometimes expresses herself with her graceful hands. The bomb injury that left one of them functionally useless just over a year ago is barely noticeable now.

On the morning of August 19, 2009, a truck bomb exploded in front of the Iraqi Foreign Ministry in Baghdad, where Noora worked in the legal department. The blast was one of a wave of bombings just minutes apart that also targeted the Iraqi Finance Ministry. The coordinated attacks were later attributed to Baathist supporters of the hanged Iraqi leader, Saddam Hussein. Fifty-two of Noora's colleagues died and at least 400 were injured.

"I was on the fourth floor, working on a new draft of a treaty," she recalls. "Suddenly, I lost my hearing. I could see for a couple of seconds and then the dark came. I lost consciousness, so I can't remember everything." A colleague found her and carried her out of the building to a public hospital crowded with the injured and dying. The bomb blast had shattered her left humerus, the long bone in the upper arm, and severed her ulnar nerve, an unusually long nerve that travels from the collarbone to the hand and partially controls hand motion and sensation. Close to the surface of the skin at the elbow, the ulnar nerve is responsible for the brief tingling pain when the "funny bone" is hit. A spray of glass shards had hit her left side, embedding in her trunk, shoulder, back, and arm.

Her mother's cousin pulled strings to send the young woman to a special hospital in Amman, Jordan. There surgeons took a bone graft from her hip to fill in the bone defect in her upper arm and attempted to repair her injured ulnar nerve.

Noora Al-Sariaa (left) and surgeon Mihye Choi, MD.

PHOTOGRAPHS BY
SASHA NIALLA

After six hours of microsurgery, Noora's hand function improved, and today she can grasp objects.

But after the surgery and a month of rehabilitation, her left hand remained frozen in a claw.

In January of 2010, less than six months after the bombing, Noora arrived in New York City to work with the UN Security Council's Counter-Terrorism Committee as part of the Iraqi Mission to the United Nations. "When I came here, I still couldn't use my hand," she says. A sleeve pushed back above her elbow reveals a Z-shaped scar, a consequence of her injury and multiple surgeries.

Through the efforts of another relative, Noora met Hiyad Al-Husaini, MD, a general plastic surgeon from Iraq who practices in New York. "Noora had a very bad injury with significant damage to her ulnar nerve, and she was not improving," Dr. Al-Husaini says. "If we left her like that she would lose functionality of the left hand. So I decided to refer her to someone who could give her the best treatment."

That someone was Mihye Choi, MD, assistant professor of surgery and a plastic surgeon with expertise in nerve reconstruction at NYU Langone Medical Center, under whom Dr. Al-Husaini had worked as a fellow.

When she met her new patient, Dr. Choi recalls, "She couldn't really grasp anything. She could not make a fist. She couldn't carry anything or open a door." Noora's initial injury was compounded by the fact that the previous surgery to repair her ulnar nerve had left a walnut-size knot of scar tissue blocking the path for new nerve fibers to grow. As a result, the nerves in Noora's forearm had all degenerated, causing the muscles in her hand to atrophy. "There was no active impulse going through, no electrical signal distal to the injury site," Dr. Choi says. "The challenge for me was not only to reconstruct her nerve but to improve her hand function immediately."

She proposed microsurgery to remove the scar tissue and then bridge the gap by borrowing a nerve from Noora's leg, the sural nerve, which provides sensation to the outside of the ankle and foot. "Even though it's a sensory nerve, without motor function, it still works and serves as scaffolding for new nerve fibers to go through that gap." Aware that nerve regeneration often takes time and is often incomplete, Dr. Choi also wanted to reroute the tendons in order to improve hand function quickly.

The scope of the proposed surgery was daunting and the young woman initially refused. "I was afraid. I'd already had three surgeries," she says. Undeterred, Dr. Choi subsequently enlisted the help of Dr. Al-Husaini and a translator, and met with Noora many times to describe the surgery. Noora finally agreed and in July 2010, she underwent the six-hour surgery.

First, orthopedic surgeon Nirmal Tejwani, MD, removed the stainless steel plate and screws from the bone graft surgery to the humerus in her upper arm, which X-rays showed had healed. Once the plate was removed, Dr. Choi stepped in to do the nerve grafting under an operating microscope, dissecting the damaged nerve and examining it slice by slice. "We look for nerve fibers that are viable so that we can cut out the injured segment and put the new nerve in its place." The goal was to repair the nerve so that new fibers could grow to the appropriate muscles and to sensory receptors in the skin.

Microsurgery is demanding and requires tremendous precision. Like an insulated electric cable carrying a thicket of wires, nerves are wrapped in layers of myelin and contain fibers for both motor and sensory neurons. The surgeon must differentiate between them by using an electric current, and she must also examine each nerve under a microscope to properly locate distinctive groups of fibers.

If the nerve fibers grow into the wrong channel in the nerve sheath, then motor fibers may grow into a sensory nerve ending and function will not be restored. "They're not color coded, you need to go by anatomical landmarks like blood vessels," Dr. Choi says.

Additionally, adults are not the best candidates for nerve reconstruction; children are. While any nerve can grow new fibers, regeneration is usually incomplete in adults, says Dr. Choi. "If you have one nerve with a thousand fibers, only a small percentage of those fibers will grow back. Success decreases with age."

To improve Noora's ability to grasp as soon as possible, Dr. Choi performed a tendon transfer. "Each finger has duplicate tendons," she explains. "So we borrowed from the index finger and the long finger to make the thumb, the ring finger, and the little finger work." To avoid an obvious scar on top of the hand, the tendon transfer surgery was done through an incision in the palm.

▸ "SUDDENLY I LOST MY HEARING. I COULD SEE FOR A COUPLE OF SECONDS AND THEN THE DARK CAME. I LOST CONSCIOUSNESS, SO I CAN'T REMEMBER EVERYTHING."

By Thanksgiving, the young woman's ulnar nerve was rapidly growing back.

Noora says she could never have received the same level of medical care in Iraq. "The top doctors have left, many scientists have left because of Saddam and the war," she says. "When I see Iraqi people injured every day—with no doctors to treat them—I feel fortunate to have come to New York City."

Shrugging off the bombing and her injuries as things of the past, Noora describes her plan to become an ambassador and work on Iraq's big issues: fostering economic security, building democracy, and fighting terrorism. Her mother, Fatima, a housewife, and her youngest brother, 10-year-old Jaafar, visited her in New York recently. Despite the ongoing violence in Iraq, the young woman's family prefers to remain in Baghdad, where her father is an electrical engineer. Of her other two younger brothers, one is a teacher in Baghdad, and the other is studying computer programming in college.

Noora herself likes the American way of life. She's taking an advanced Berlitz course in English and hopes eventually to earn a doctorate in law.

How is her hand today? "I'm satisfied," Noora says. Now she can grasp and carry objects and make a fist. "It feels normal." ●

—AUBIN TYLER

Fostering an Entrepreneurial Culture

NYU's Innovation Venture Fund inspires discovery.

WHILE MANY SCIENTISTS dream of seeing their discovery become a lifesaving medicine, the gap between the laboratory and the bedside is wide and frequently daunting. New York University aims to bridge the gap by aiding privately held companies that are commercializing discoveries owned or developed by the University.

The NYU Innovation Venture Fund, created last year with a $3 million infusion from the University, invests in start-ups based on NYU technologies and intellectual properties, explains Frank Rimalovski, the Fund's managing director. In recent years, he notes, NYU has converted intellectual property into more licensing income than Stanford, Columbia, MIT, Harvard, or the University of California system. In the last two decades, 56 start-ups have been built on NYU discoveries, generating over $50 million in income to the University. The Fund will bolster that strength, Rimalovski says.

Perhaps the best-known example of a product based on the University's laboratory research is Remicade, a therapy for rheumatoid arthritis and half a dozen other autoimmune diseases, used by more than a million people worldwide. The blockbuster drug, which accounted for nearly $6 billion in sales last year, is based on the research of Jan T. Vilcek, MD, PhD, professor of microbiology, and Junming Le, PhD.

Whether schussing the ski slopes of Vermont with his daughters or meeting with potential investors, Rimalovski revels in others' success. "I get a charge out of seeing others succeed—take my kids on the slopes. It's the same feeling when I see an entrepreneur doing great things," he says.

Part of his job is to foster a culture and spirit of entrepreneurship at the University. "It's not just about having the best technology or the most brilliant scientists," Rimalovski says. "It's got to be the culture. And it's got to be in the water, it's got to be in the mind-set of NYU.... We're in a unique position as the largest and most diverse university in the New York ecosystem." As a result, NYU can and should play a fundamental role in the entrepreneurial economy in the area, he says.

The fund, which is expected to grow to $20 million, complements the work of the Office of Industrial Liaison/Technology Transfer based at NYU Langone Medical Center, which focuses on bringing discoveries by NYU researchers to market through collaborations with industry.

Many critical steps are necessary to bring discoveries from the laboratory to the patient, and Rimalovski often finds his role to be that of a cultural emissary and, indeed, cheerleader of NYU's scientific, medical and technological innovations.

As befits an organization that supports the marketing of the most advanced technologies, its managing director is similarly forward thinking. "I live and breathe e-mail and cell," Rimalovski says. His office is more virtual than physical, since he considers networking within the University one of his primary functions and hates to be tied to a desk.

▸ "WE'RE IN A UNIQUE POSITION AS THE LARGEST AND MOST DIVERSE UNIVERSITY IN THE NEW YORK ECOSYSTEM."

Along with attending venture capital conferences and acting as NYU's entrepreneurship "ambassador," Rimalovski oversees the Entrepreneurs Speaker series, which this winter had Ryan Jacoby of IDEO discuss innovation leadership problems and ways to avoid them. Arthur Klausner, former partner of Domain Associates and Pappas Ventures, spoke about decision-making processes of life-science venture capital investors.

Rimalovski, 45, has a BA from Tufts University and an MBA from Duke University's Fuqua School of Business. He honed his skills in Silicon Valley and later became director/entrepreneur-in-residence at Lucent's New Ventures Group. More recently he was a partner and co-founder of New Venture Partners, a venture capital firm that funds early-stage technology spinouts and has more than $700 million under management.

Through his work with start-up companies, Rimalovski knows the importance of sustaining a business once it has started, and so the NYU Venture Fund is evergreen, meaning that profits or realized gains from investments in NYU technology are recycled to sustain the fund. Donations made to the Fund qualify as tax-deductible charitable contributions to New York University, and each donor will receive a gift receipt from NYU for tax purposes. ● *—JUDITH SCHOOLMAN*

Frank Rimalovski, managing director, NYU Innovation Venture Fund

PHOTOGRAPH BY
SASHA NIALLA

Solomon A. Berson Alumni Achievement Awards for 2011

Named in memory of the brilliant researcher and 1945 graduate of NYU School of Medicine, whose work contributed to the development of the radioimmunoassay, the Berson Awards are given to three distinguished alumni annually on Medical Alumni Day. Outstanding achievement by a young alumnus was also recognized this year on Saturday, April 2, and a major benefactor of our institution was named an honorary alumna.

Award in Basic Science

Arnold R. Kriegstein, MD ('77), PhD ('77GSAS), MS ('75GSAS), is renowned for his pioneering research on neuronal stem cells in the developing brain, which has advanced the understanding of a range of disorders from schizophrenia to epilepsy. He is currently the John G. Bowes Distinguished Professor of Stem Cell and Tissue Biology and director of the Eli and Edythe Broad Center of Regeneration Medicine and Stem Cell Research at the University of California, San Francisco. Dr. Kriegstein has pursued many projects throughout his distinguished career and published widely, to much acclaim. He is especially well known for solving a question whose answer had eluded researchers for decades: the identity of neural stem cells within the central nervous system. His discovery that radial glia are stem cells opened the way to potential therapies for neurodegenerative diseases. A native of Germany, Dr. Kriegstein has held academic appointments at New York University, Harvard University, Stanford University, Yale University, and Columbia University.

Award in Clinical Science

William Borkowsky, MD ('72), is an internationally recognized leader in pediatric AIDS. Since the onset of the AIDS epidemic in the 1980s, he has been involved in pioneering new therapies for HIV-infected children and their mothers, both as clinician and researcher. He completed his pediatric residency and fellowship training in immunology and infectious diseases at the School of Medicine and then joined the faculty of NYU, where he has spent his entire career. He is now professor of pediatrics and director of the Division of Pediatric Infectious Disease and Immunology. Dr. Borkowsky is also director of the Clinical Research Unit of the NYU Clinical Translational Research Institute and director of the Virology/Molecular Diagnostics Core Lab at the NYU Center for AIDS Research. On the national level, he chairs committees of the National Institute of Allergy and Infectious Diseases and, internationally, is director of the International Maternal Adolescent AIDS Clinical Trials Unit.

Award in Health Science

Richard F. Edlich, MD ('62), PhD, a gifted educator and researcher, has developed medical innovations, including an adhesive skin closure tape called "Steri-Strips" and a skin wound cleanser that is safe enough to be poured into a patient's eye. During his wide-ranging career Dr. Edlich also helped develop an emergency plan credited with helping save President Ronald Reagan's life in 1981, when a would-be assassin shot him. Following a medicine internship at Buffalo General Hospital, Dr. Edlich completed a general surgery residency at the University of Minnesota, where he earned a PhD. He subsequently trained in plastic surgery at the University of Virginia and founded the burn and wound healing center there. Furthermore Dr. Edlich realized these inspiring accomplishments even as he battled multiple sclerosis.

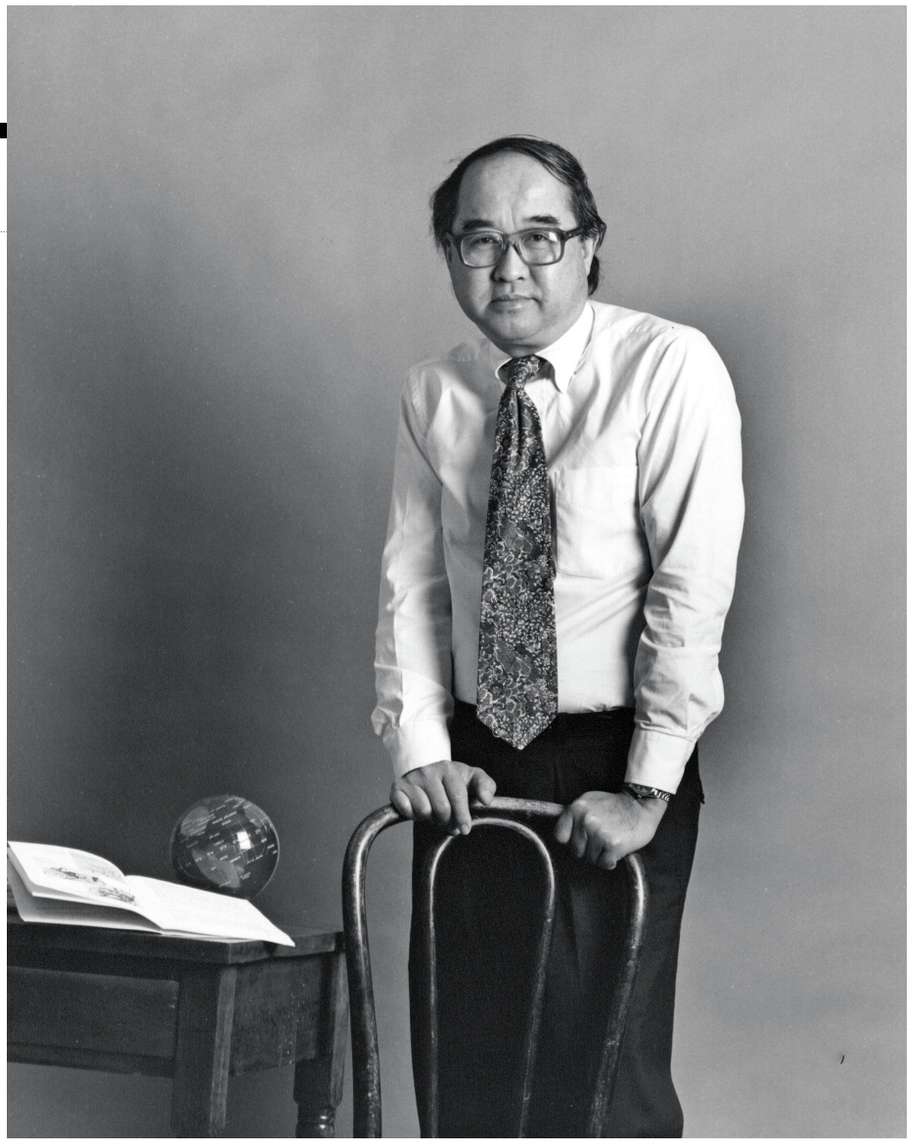
Julia Zelmanovich Young Alumni Award

Manish S. Parikh, MD ('01), has demonstrated extraordinary leadership in the 10 years since he graduated from medical school. An assistant professor of surgery at NYU School of Medicine, Dr. Parikh is also medical director of Bellevue Hospital's laparoscopic bariatric surgery program. He completed his surgery residency at NYU and a laparoscopic and bariatric surgery fellowship at New York-Presbyterian Hospital. He is currently pursuing a Master of Science degree in clinical investigation in translational medicine. Dr. Parikh is a member of Alpha Omega Alpha and a recipient of the Valentine Mott Prize for outstanding achievement as a surgical scholar and the New York City Health and Hospitals Corporation Doctor's Day Award for commitment to advancing the mission of the public hospital system, among other awards and honors.

Honorary Alumna

In the Class of 2011

Sylvia K. Hassenfeld has been a trustee of NYU Langone Medical Center since 1984 and a generous benefactor of the School of Medicine. She was named an honorary member of the Class of 2011. A former director of Hasbro, her family's toy business, she has focused the company's and the family's legendary philanthropy on improving the lives of children. Her major gifts to the Medical Center have established the Stephen D. Hassenfeld Children's Center for Cancer and Blood Disorders, which is devoted exclusively to the outpatient treatment of children and to addressing the emotional needs of children and their families. Mrs. Hassenfeld has also served as a leader in other nonprofit organizations, including as former vice chair of both Brandeis University and the United Jewish Appeal. She is also the first woman to be elected president of the American Jewish Joint Distribution Committee, an international relief, rescue, and rehabilitation group.

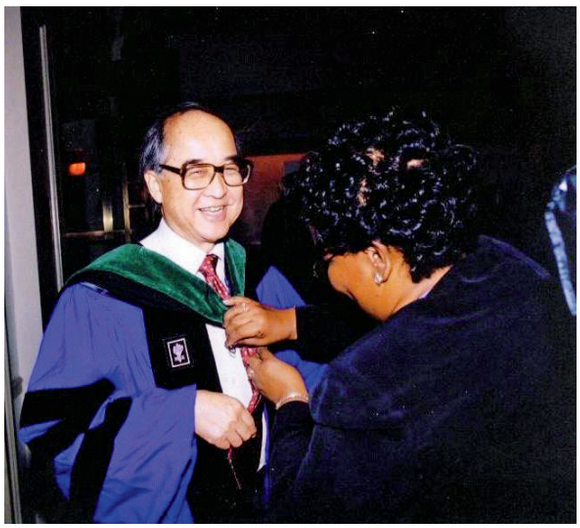


MATHEW H.M. LEE, MD

MATHEW H.M. LEE, MD, who led the world-renowned Howard A. Rusk Institute for Rehabilitation Medicine for nearly two decades—first as acting chair of the Department of Rehabilitation Medicine from 1989 to 1997, and then as chair until 2008—died in Hawaii on March 11, 2011; he was 79 and had been battling cancer since being diagnosed in 1998.

Dr. Lee presided over the treatment of tens of thousands of patients annually at NYU Langone Medical Center and its affiliates. Under his leadership, Rusk ranked number one in its field in the New York metropolitan area for 18 consecutive years and trained 23 departmental chairs in the United States, six others abroad, and more than 2,000 rehabilitation specialists worldwide. In 1997 he was awarded the Howard A. Rusk Endowed Professorship in recognition of his achievements.

A first-generation American, he was born in 1931 in Wahiawa, Hawaii. His parents toiled in pineapple fields, and the family of six lived in a one-bedroom wooden house on the plantation. His devoted parents saw to it that all four of their children went to college. After attending Johns Hopkins University on a scholarship, Dr. Lee earned his medical degree from the University of Maryland, where the National Foundation for Infantile Paralysis selected him for a summer fellowship in infectious diseases; he earned his master of public health degree with honors from the University of California, Berkeley.



When he was 26, Dr. Lee enlisted in the U.S. Navy to care for sailors on eight destroyers, a submarine, and a mother ship. After discharge, Dr. Lee joined the U.S. Public Health Service, where he rose to the rank of full commander. It was during this time that he met Dr. Howard Rusk, the father of comprehensive rehabilitation medicine, with whom he traveled to China to open the first rehabilitation center in Peking. In 1962 Dr. Lee came to the Medical Center for his residency, becoming the first physician in the country to be trained in both prevention medicine and rehabilitation medicine.

The author and editor of eight books and 115 scientific papers, Dr. Lee received numerous awards and honors, including the Distinguished Clinician Award from the American Academy of Physical Medicine and Rehabilitation, the prestigious 2006 Honor Award and Gold Key to the University of Maryland for his outstanding contributions to medicine and distinguished service to humanity, the Help Us Give (HUG) Award, Music Has Power Award, Spirit of Hope Award from the World Rehabilitation Fund, and the Howard A. Rusk Award for his outstanding contributions in the field of rehabilitation medicine.

At his death, Dr. Lee had served the Rusk Institute for more than 45 years, creating a rich legacy of humanism in medicine and making important advances in the treatment and research of chronic pain, thermography, acupuncture, and music therapy. ●

DR. ANN LUBLIN WITUS

The Gift *of a* Lifetime

ANN LUBLIN WITUS, MD, ('43), met her late husband, Carl Witus, MD, after World War II when they were pediatricians at the Children's Hospital of Michigan and Wane State University School of Medicine. For years, Ann and Carl both maintained private practices and taught at Wayne State. After they retired, Ann and Carl wanted to give back to their medical schools.

With a gift of appreciated stock to NYU Langone Medical Center, they established the Dr. Ann Lublin Witus Scholarship Fund, which will be substantially augmented through her estate, including a will bequest, several gift annuities, and a charitable remainder trust. In making these meaningful gifts, Dr. Lublin Witus receives tax benefits and an income stream for life.

You, too, can make a difference at NYU Langone. To learn more about how to create your own legacy, please contact Marilyn Van Houten at 212.404.3653 or email her directly at marilyn.vanhouten@nyumc.org

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