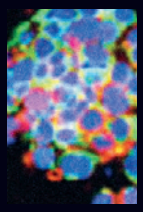
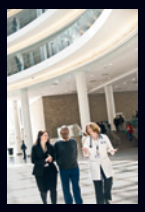
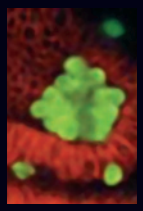
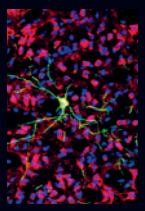
Transformative Science

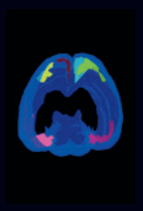
2009 RESEARCH REPORT

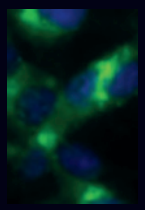








NYU Langone Medical Center


12%
Growth in research funding from 2006 to 2008
Income from pharmaceutical royalties and other products in 2007
$791 MILLION
543
Total number of U.S. patents issued to NYU Langone Medical Center
Space devoted to basic and clinical research
504,977
square feet
$29.4 MILLION
Amount of NIH funds awarded to NYU and the New York City Health and Hospitals Corporation in 2009 for Clinical and Translational Science Institute
1,500
Estimated number of active clinical research projects at NYU Langone Medical Center

Passion. Energy. Determination. Excellence. These are just a few of the qualities that define the extraordinary scientists of NYU Langone Medical Center. Supported by an environment that fosters collaboration and intellectual exchange, our researchers make remarkable discoveries and translate them into patient care. The result: research that dramatically transforms the way disease is diagnosed, treated, and ultimately, eradicated.

Letter from the Dean and CEO, and the Vice Dean for Science:

It is, unquestionably, an exciting time at NYU Langone Medical Center.

By all metrics, we are on the move. Last year our faculty published over 4,000 research papers. Our grant funding rose 9 percent. The number of inventions increased 7 percent; new license agreements, 5 percent; and technology transfer revenue, 20 percent. These numbers reflect the outstanding quality of our research and our collective impact on science and health.

In addition, three more NYU Langone scientists were named Howard Hughes Medical Institute (HHMI) investigators—a prestigious designation reflecting strong endorsement and funding support for their work—including two as part of HHMI's Early Career Scientists Program. We welcomed the inaugural class of our Physician Scientist Training Program, designed to give residents and fellows the research skills needed to conduct the highest caliber science. We also continued to attract the best and brightest faculty from around the world, researchers who will help transform science, medicine, and education.

Over the past 15 months, during the direst financial crisis in eight decades, we received four nine-figure gifts—a record, to the best of our knowledge, for any nonprofit institution. We are the beneficiaries of an exceptionally supportive Board of Trustees and other champions whose gifts are a resounding affirmation of the work we do, the extraordinary caliber of our researchers, and our unswerving commitment to science.

The pages that follow provide a glimpse of the outstanding scientific work under way at NYU Langone, beginning with our new NIH-funded University-wide Clinical and Translational Science Institute (CTSI). A broad collaboration reaching from basic research on disease processes to large-scale community studies to innovations in medical education, CTSI augments the six Centers of Excellence established last year, which bring together more than 300 of our basic and translational scientists.

We move on to highlight other exciting collaborative work including the integration of basic stem cell research with genetic studies that is providing remarkable new insights into diseases such as childhood leukemia. We show how molecular analysis of breast cancers is being used to reveal subtypes that may respond to specific treatments. And, our neuroanatomical and genetic investigations are offering novel ways to track the earliest signs of Alzheimer's disease in the brain.

We also profile a sampling of significant discoveries made by our scientists over the last year in such fields as microbiology, oncology, infectious diseases, and immunology. The discoveries reflect a remarkable range of transformative science—from the technical tour de force of sequencing the DNA of a malaria parasite to policy-influencing epidemiologic studies on the health effects of ozone pollution.

We congratulate our researchers for their extraordinary achievements and we welcome our newest faculty colleagues who are joining us in building this great institution. Together we are committed to the fundamental advancement of science and ensuring it makes a profound difference to medicine worldwide in the years ahead.

We invite you to read about the transformative science under way at NYU Langone Medical Center in the pages that follow.

Sincerely,

Robert I. Grossman, MD
The Saul J. Farber Dean and
Chief Executive Officer

Vivian S. Lee, MD, PHD, MBA
Vice Dean for Science
Senior Vice President and
Chief Scientific Officer


C O L
L A B
O R A
T E
Great
Minds
Thinking
Together

Collaboration inspires new ideas and discoveries. Take a look at the stories on the next few pages. Six research teams—different sizes, different goals, different disciplines—but all multidisciplinary, all patient centered, all looking to shorten the distance from the research bench to the patient bedside and back again.

Accelerating Research and Improving Patient Outcomes

New Clinical and Translational Science Institute Established at NYU in Partnership with New York City Health and Hospitals Corporation

Shown here are some of the more than 150 members of the Clinical and Translational Science Institute established by NYU, the Medical Center, and the New York City Health and Hospitals Corporation. The institute, funded recently by a $29.4 million, five-year grant from the National Institutes of Health, offers innovative training and collaborative opportunities for medical researchers. It will also explore new ways of reducing healthcare disparities, and ultimately advance discoveries from the lab to patients and wider communities. Collaborators across the Medical Center and the New York University campus are strengthening our historic alliance with Bellevue Hospital—the nation's oldest public hospital—and other institutions within New York's Health and Hospitals Corporation, one of the country's largest municipal healthcare systems.

Translating Discoveries into Interventions

NYU Langone researchers recently discovered that New York City's Pakistani and Indian communities suffer from an unusually high rate of premature coronary artery disease. The discovery led them to develop a new intervention aimed directly at this high-risk population: culturally appropriate motivational DVDs. Along with nutritional counseling, pedometers to measure exercise, and other strategies, Dr. Judith Hochman says a pilot study and planned clinical trial by NYU's strong team of community and immigrant health investigators using DVDs to encourage better adherence to treatment regimens may be key to improving the health of the city's South Asian immigrants.

The city health department can ban unhealthy trans fats from fast-food restaurants, she says, but how do you ensure that a neighborhood's local grocery has affordable fruits and vegetables or that its residents have a safe place to exercise? In other words, she asks, "How do you make structural changes that will help reduce healthcare disparities?" Translating discoveries out of the lab and clinic, then, encompasses not only proven drug therapies, but also educational and mobilizing tools that can make an equally lasting difference toward improving life in the city.

JUDITH S. HOCHMAN, MD, is co-director, Clinical and Translational Science Institute; the Harold Snyder Family Professor of Cardiology; chief, Leon H. Charney Division of Cardiology; director, Cardiovascular Clinical Research Center.

Transforming Clinical Research Education

The new institute's educational arm is multifaceted. Dozens of established mentors will help foster a new environment of side-by-side partnerships with promising investigators. Two clinician-scientist training programs that debuted in 2008 give doctors a better grounding in basic research. A separate fellowship provides budding scientists with an introduction to clinical research, while physicians can receive a master of science degree in clinical investigation. In addition, certificate programs are training community-based workers in the kinds of research that matter most to them.

The wholesale rethinking of training, education, and career development is aimed squarely at more efficiently mobilizing the entire University and its many partners to drive discoveries from the lab to the bedside and into the community. With July's major announcement of a new $29.4 million grant from the National Institutes of Health, Dr. Bruce Cronstein says, the institute will be well positioned to support a new generation of researchers whose collaborative and community-minded investigations further bind the University to the world beyond its walls.

BRUCE CRONSTEIN, MD, is director of the Clinical and Translational Science Institute; the Dr. Paul R. Esserman Professor of Medicine; professor of pathology and pharmacology; director, Division of Clinical Pharmacology; associate chair for research, Department of Medicine.

Advancing Basic Research through Collaboration

In Dr. Edward Fisher's fight against atherosclerosis, basic research in mice fuels new clinical interventions. The disease, in which artery walls accumulate fatty plaques, leads to heart attacks if a plaque ruptures and blocks blood flow. "The ultimate treatment for this would reverse plaques in your arteries," Dr. Fisher says. "A major focus of my research is to identify factors that shrink plaques."

Dr. Fisher, a physician-scientist who splits his time between bench science and seeing patients, has already discovered multiple factors associated with worsening or improving plaques in mice, and plans to apply this knowledge to patients. He has also pioneered a genetic method in mice that raises the blood's "good" cholesterol, dramatically shrinking their plaques, and a technique to isolate plaque cells for detailed study.

Dr. Fisher is adapting his findings to noninvasive magnetic resonance imaging (MRI) to distinguish relatively stable plaques from those most likely to cause heart attacks in humans. Collaborations with interventional cardiologists and experts in bioinformatics at the Medical Center are helping him achieve his goals.

EDWARD A. FISHER, MD, PHD, MPH, is the Leon H. Charney Professor of Cardiovascular Medicine; director of the Preventive Cardiology Center; and co-director, Translational Research, CTSI.

"This institute is designed to transform the way we carry out research, and also the way we train researchers."

DR. BRUCE CRONSTEIN, DIRECTOR, NYU–HHC'S CTSI

Seen here is a technician in NYU Langone's Vaccine and Cell Therapy Laboratory, which serves as a core facility for making immunotherapies.

Increasing Collaborative Problem-Solving

For a recent study on whether people struggling with an addiction to heroin or prescription painkillers might benefit from treatment regimens that are initiated at home, Dr. Marc Gourevitch and his colleagues received direct support from the New York City Health and Hospitals Corporation and the Department of Health and Mental Hygiene. Such a partnership, says Dr. Gourevitch, is essential to the CTSI's primary objective: to translate research findings into real-world applications that have the maximum effect.

Dr. Gourevitch notes that while clinicians and basic scientists make important contributions, database analysts, behavioral researchers, and health economists also play vital roles in identifying solutions to key challenges. As the institute's reach expands, he hopes to recruit experts who can pinpont specific indicators of a community's healthcare needs. "We can then use them," he says, "to see if what we're doing is actually helping."

MARC GOUREVITCH, MD, MPH, is the Dr. Adolph and Margaret Berger Professor of Medicine; professor of psychiatry; director, Division of General Internal Medicine; director, Population Health Resource of the Clinical and Translational Science Institute.

Building Bridges to the Community

When the Institute of Community Health and Research at NYU Langone Medical Center joined with 20 local groups to launch the largest epidemiological study ever conducted in New York City, no one knew the prevalence of hepatitis B among the city's Chinese and Korean immigrants. After screening nearly 10,000 residents in community centers, banks, and other businesses, astonished researchers calculated a prevalence of 15 percent.

For the Chinese American community, the city-funded BFreeNYC campaign yielded a new clinic at Bellevue Hospital and a massive vaccination campaign. For the institute, led by Dr. Mariano Rey, there is now an enviable pool of potential participants for a clinical trial. Based on the needs of other communities, the institute helped form a coalition to investigate the high prevalence of premature cardiovascular conditions among Filipinos. A similar alliance is addressing mental health and risky behaviors among Vietnamese and Cambodian immigrants. Building bridges based on trust, Dr. Rey says, is the way to true engagement. "If you try to do something that doesn't interest the community," he says, "it isn't going to fly."

MARIANO REY, MD, is the senior associate dean for community health affairs; director, Institute of Community Health and Research; assistant professor of medicine and physiology and neuroscience; director, Community Engagement Core of the Clinical and Translational Science Institute.

CTSI STATISTICS

Source: NYU Langone Medical Center, the Health and Hospitals Corporation, and NYU College of Dentistry

9	15	75	200	8,000	2,000,000
Schools and colleges	Large medical and dental facilities	Departments	Laboratories	Clinicians and physicians	Patients served at the 15 medical and dental facilities in 2008

"NYU's CTSI program is broader than the School of Medicine and the University. It is strengthening the connection to eight hospitals in the city's Health and Hospitals Corporation as well as to the vibrant multiethnic communities of New York, all with the goal of providing innovative prevention programs and treatments for patients in New York and beyond."

ALAN AVILES, PRESIDENT AND CEO
NEW YORK CITY HEALTH AND HOSPITALS CORPORATION

30,000

Number of children and adults in the U.S. affected by cystic fibrosis. Source: Cystic Fibrosis Foundation

Basic stem cell research holds incredible promise for understanding disease mechanisms. From left to right: JAMIE GRIFO, MD, PHD, professor of obstetrics and gynecology; director, Division of Reproductive Endocrinology; program director, NYU Fertility Center (seated); CHRIS HANSIS, MD, PHD, assistant professor of obstetrics and gynecology; IANNIS AIFANTIS, PHD, associate professor of pathology; co-director, Cancer Stem Cell Program at the NYU Langone Medical Center's Cancer Institute; RUTH LEHMANN, PHD, director, Skirball Institute of Biomolecular Medicine; director, Helen L. and Martin S. Kimmel Center for Stem Cell Biology; Laura and Isaac Perlmutter Professor of Cell Biology.

Fruit Flies, Blank Slates, and Incurable Diseases

Stem Cell Research at NYU Langone

You can learn a lot from fruit flies with unusually notched wings. Or roundworms that cannot lay eggs. Or young mice that develop leukemia.

As Dr. Ruth Lehmann and colleagues in the Helen L. and Martin S. Kimmel Center for Stem Cell Biology have discovered, many genes implicated in these deformities and disorders are essential for our normal development and reproduction. "For 70 percent of all disease genes known in humans, there's an exact homologue in the fly," Dr. Lehmann says.

Stem cells, the "blank slates" that can become any cell in an embryo, are essential mediators of development and potential gold mines for therapeutic interventions. Adult stem cells are more restricted but have similarly untapped promise. The strong grounding of Kimmel Center scientists in developmental biology and their pursuit of disease models with different stem cell types, Dr. Lehmann says, provide a solid foundation for a burgeoning field of research. "All of that is very basic research with clinical relevance to understand disease better," she says. "And that's very exciting."

Two of Dr. Lehmann's colleagues, Dr. Jamie Grifo and Dr. Chris Hansis, are modeling human disease using stem cells from embryos otherwise discarded in the in vitro fertilization clinic.

Dr. Grifo, an expert in what's known as preimplantation genetic diagnosis, has helped uncover incurable diseases like cystic fibrosis and Tay-Sachs in early-stage embryos in an effort to select the most viable ones for implantation in a mother's womb. Clinics throughout the world have used the technique to test for more than 300 genetic disorders. "The fate of these embryos in the past was to discard them," Dr. Grifo says. "It's kind of a natural progression to say, 'Maybe we can learn something about these diseases using these cells.'"

Dr. Hansis has used 10 embryos diagnosed with genetic mutations and voluntarily donated by patients at NYU Langone's Fertility Center to grow embryonic stem cells. "A lot of frequent, fatal, and incurable diseases currently do not have disease models," Dr. Hansis says, "and yet you need that to develop new therapeutic approaches."

Another team in stem cell research is focused on leukemia. Dr. Iannis Aifantis studies how hematopoietic stem cells, or adult stem cells that live in the bone marrow and give rise to a variety of blood cells, can renew themselves or transform into other cells as needed. When underlying mechanisms are disrupted, cancer is a potential consequence. "It is very interesting to see that the same molecules that are important for leukemia are also important for stem cell function," Dr. Aifantis says.

One common denominator is a famous gene called Notch, so named because its disruption yields notched wings in fruit flies. In mice, a genetic counterpart named Notch1 is essential for telling stem cells to become the immune system's infection-fighting T cells. If the gene is overactive and the body produces too many T cells, leukemia can result.

Two molecules controlled by Notch1, Dr. Aifantis has found, allow a kind of childhood leukemia to invade the body's central nervous system, with devastating consequences. The genes associated with the molecules are highly conserved, or found in many organisms, so he may be able to call upon fruit flies—or roundworms—in the hunt for more information about a critical stem cell regulator and disease culprit.

New Approaches to Breast Cancer

Translational Research and Breast Cancer at NYU Langone

Shortly after her arrival at NYU Langone in 2000, Dr. Silvia Formenti gave a spirited talk in which she discussed her frustration as a clinician that early and advanced breast cancers were still being treated as a single entity. Her rejection of the one-size-fits-all approach to surgery, chemotherapy, and radiation struck a chord with the audience, and in particular with Dr. Robert Schneider.

At the time, Dr. Schneider recalls, "a family member of mine was faced with an inability to make a decision about how to be treated because so little was actually known, which I found astounding, given all the work that had been done in breast cancer. At the same time, I was hitting a point in my career where I wanted to do more than basic research."

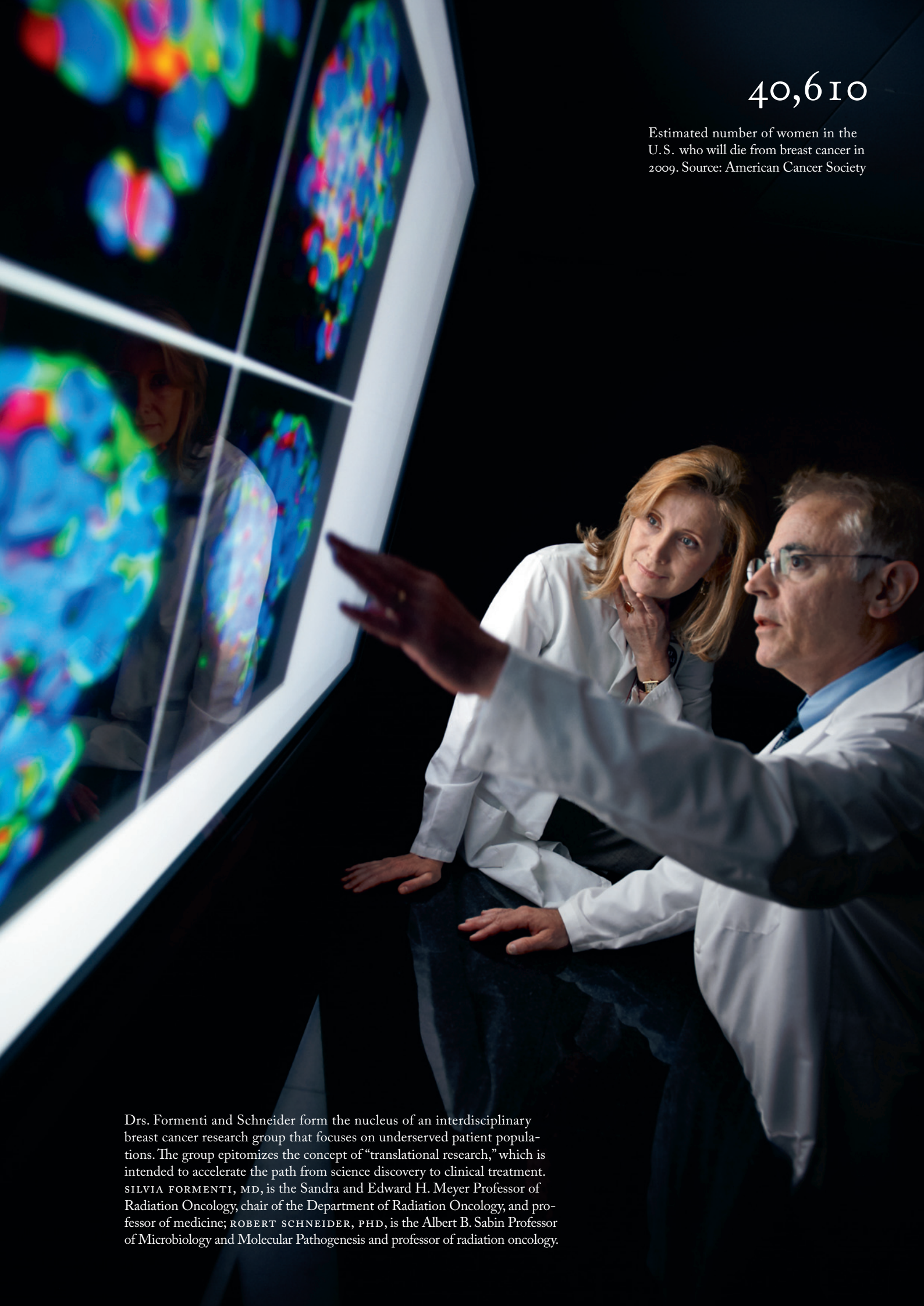
At the beginning of their joint venture, the clinician and the basic scientist sought to understand the molecular characteristics of a type of cancer called locally advanced breast center, or LABC. "This disease manifests itself as a large breast tumor, but has a window of opportunity before it will spread, and we were trying to understand why," Dr. Formenti says. From that single question, the research has expanded in a range of directions and received prominent recognition and support as a Center of Excellence by the U.S. Department of Defense. The researchers have also received underlying support from the Breast Cancer Research Foundation.

At the molecular level, Dr. Schneider is trying to define the disease—typically classified as a tumor bigger than 5 centimeters—and how it grows. From that work, however, he has identified the molecular mechanism that promotes a very different subtype known as inflammatory breast cancer, which is relatively uncommon but a significant cause of death.

Another arm of research is extending far beyond the lab and clinic to understand the ethnic, cultural, socioeconomic, psychological, and genetic differences among different populations of women that might contribute to cancer vulnerability. In other words, can one definition of cancer be broadly applied to different groups? "All these questions are very relevant from an industry point of view because let's say we find the perfect drug for this," Dr. Formenti says. "Does the drug apply to everybody?"

The willingness to ask new questions has led to multiple advances. A stream of successful clinical trials for both breast and prostate cancers has flowed from their collaboration. They found that chemotherapy altered the cell-division cycle of the tumors in a way that made them most vulnerable to radiation. They also discovered a toggle switch that controls the recruitment of blood vessels and growth factors that support the expansion of locally advanced breast cancer. They also found that radiation not only directly kills tumors but also elicits a broad immune response against other tumors.

Working together with mutual respect, both researchers say, has allowed an increasingly diverse group of specialists to inform each other's work and ask increasingly complicated questions aimed at one simple goal: having an impact on cancer.



40,610

Estimated number of women in the U.S. who will die from breast cancer in 2009. Source: American Cancer Society

Drs. Formenti and Schneider form the nucleus of an interdisciplinary breast cancer research group that focuses on underserved patient populations. The group epitomizes the concept of "translational research," which is intended to accelerate the path from science discovery to clinical treatment. SILVIA FORMENTI, MD, is the Sandra and Edward H. Meyer Professor of Radiation Oncology, chair of the Department of Radiation Oncology, and professor of medicine; ROBERT SCHNEIDER, PHD, is the Albert B. Sabin Professor of Microbiology and Molecular Pathogenesis and professor of radiation oncology.

Dr. Judith Aberg and Jean Gatewood with Royal Sams, a patient, in the atrium of Bellevue Hospital. Dr. Aberg and Ms. Gatewood collaborate on clinical trials for investigational AIDS therapies. JUDITH A. ABERG, MD, associate professor of medicine, Division of Infectious Diseases and Immunology, and director, NYU/Bellevue AIDS Clinical Trial Unit. JEAN M. GATEWOOD, director, Office of Clinical Trials, Department of Hospital Services.

Percent of New York City's AIDS-related deaths in 2007 accounted for by blacks and Hispanics. Source: New York City Department of Health and Mental Hygiene

84.7%

Streamlining Clinical Trials to Fight AIDS

AIDS Clinical Trial Unit and the Office of Clinical Trials at NYU Langone

Dr. Judith Aberg, who heads up the NYU/Bellevue AIDS Clinical Trial Unit, wanted to know whether an effective and well-tolerated HIV medication would also cross the placenta to prevent HIV-positive pregnant women from transmitting the virus to their newborns. She knew the answer could be critical for treating mothers-to-be. "A mother who is not on HIV medication could have a 24 to 40 percent chance of infecting her child," says Dr. Aberg, "and women who present late in their pregnancy do not have time to get their HIV under control. They need medicines that will cross the placenta to prevent transmission." Dr. Aberg mentored Dr. Michelle Cespedes, a new faculty member, and together they were able to obtain funding for their clinical study.

Dr. Aberg also knew the success of her proposed trial would depend on her ability to implement it in a timely and efficient manner. Luckily, she entrusted the complicated logistics needed to get the study off the ground to a beefed-up team of specialists in the Office of Clinical Trials, led by new director Jean Gatewood. "She has a great last name, because she is the 'gatekeeper' in many ways," Dr. Aberg says. "Jeanie has taken ownership and responsibility for helping us get our trials done."

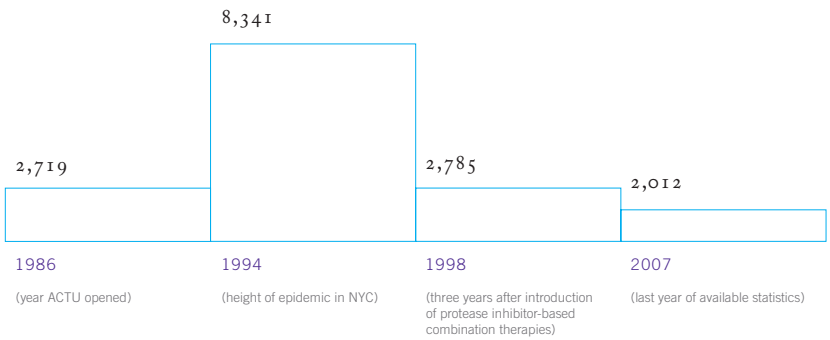
The NYU/Bellevue ACTU has sponsored hundreds of trials since opening its doors in 1986. It began by enrolling mostly gay white men in its trials, aimed at developing new treatments for HIV, AIDS, and related complications. Today, roughly 90 percent of its patients are either Hispanic or African American, and half are women.

Trials of prospective AIDS therapies are part of an extensive network of clinical trials at NYU Langone. Currently, about 1,500 active clinical trials are under way at the Medical Center in partnership with 625 investigators from more than 60 departments. Ms. Gatewood has forecast a remarkable 20 percent jump in industry-sponsored clinical trial activity from 2008 to 2009. This increase is due in part to brokering master agreements with industry sponsors to expedite trials. "Rather than taking months to negotiate, it takes minutes," she says.

For Dr. Aberg, the stepped-up support means being free to focus on what really matters: improving the quality of life for her HIV-positive patients, and fighting to ensure that the next generation remains HIV negative.

TRENDS OF HIV- AND AIDS-RELATED DEATHS IN NEW YORK CITY

Source: New York City Department of Health and Mental Hygiene



The Roots of Alzheimer's Disease

Neuroscience Collaboration at NYU Langone

The establishment in 2008 of the Center of Excellence on Brain Aging at NYU Langone spurred conversations among many neuroscientists and clinicians about their shared research interests. One result is a new multidisciplinary collaboration aimed at tracking down the earliest stages of an incurable illness expected to affect 16 million Americans by 2050—Alzheimer's. The collaboration is just one of over 30 independently funded studies supported by more than $18 million annually in federal research funding within the center.

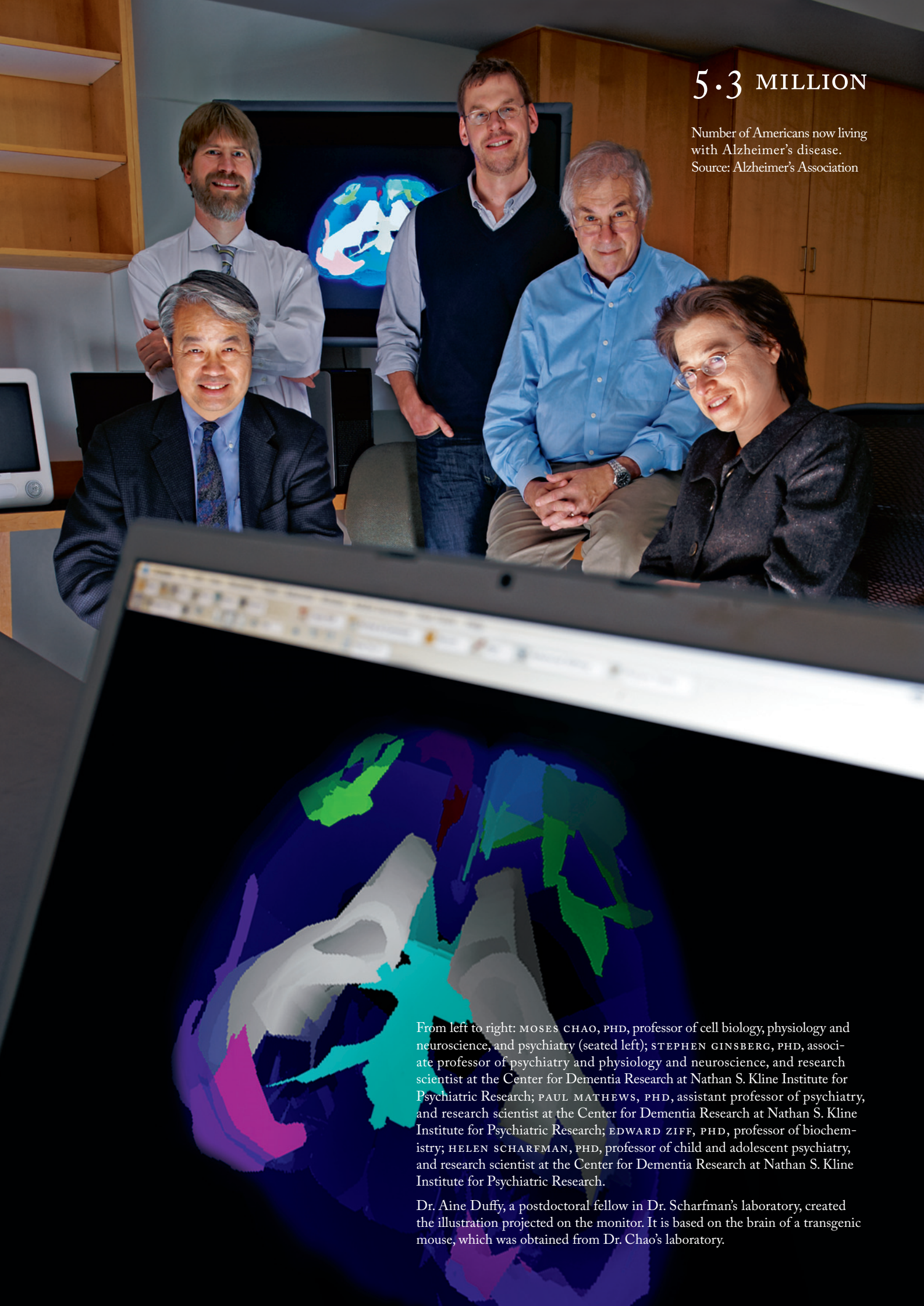
Dr. Helen Scharfman, an expert in electrophysiology at the Nathan S. Kline Institute for Psychiatric Research, an affiliate of NYU School of Medicine, is coordinating the new research collaboration on Alzheimer's disease. She notes: "It's very exciting for a scientist to see a question that has high impact and has not been solved, and now we have hints of how to address it and how to solve it."

Five collaborating researchers are focusing on a specific group of neurons in an understudied part of the brain called the entorhinal cortex, which is critical for memory processing. A major question is whether the initial stages of Alzheimer's disease can be traced back to these vulnerable neurons. "It's like a crime mystery, and we're trying to figure out where it begins," says Dr. Stephen Ginsberg, a fellow collaborator and neuroscientist.

One clue, according to Alzheimer's specialist Dr. Paul Mathews, is that nerve-damaging protein plaques in patients' brains seem to accumulate first within those same neurons. Dr. Edward Ziff, who is based at the NYU Langone campus and who studies the proteins needed for neurons to send signals, will lend his expertise to help determine whether early disruptions of this signaling contribute to the neurons' demise. Another question is whether the gradual degeneration of nerve cells contributes to disease progression.

"It's not that these neurons die all of a sudden, it takes years for this to happen," says Dr. Moses Chao, an expert on the growth factors needed to keep neurons healthy. With more knowledge of the underlying mechanism, he and his colleagues might be able to develop molecules to protect the most susceptible cells and delay or even halt the progress of Alzheimer's.

"It's very exciting for a scientist to see a question that has high impact and has not been solved, and now we have hints of how to address it and how to solve it." DR. HELEN SCHARFMAN



5.3 MILLION

Number of Americans now living with Alzheimer's disease.
Source: Alzheimer's Association

From left to right: MOSES CHAO, PHD, professor of cell biology, physiology and neuroscience, and psychiatry (seated left); STEPHEN GINSBERG, PHD, associate professor of psychiatry and physiology and neuroscience, and research scientist at the Center for Dementia Research at Nathan S. Kline Institute for Psychiatric Research; PAUL MATHEWS, PHD, assistant professor of psychiatry, and research scientist at the Center for Dementia Research at Nathan S. Kline Institute for Psychiatric Research; EDWARD ZIFF, PHD, professor of biochemistry; HELEN SCHARFMAN, PHD, professor of child and adolescent psychiatry, and research scientist at the Center for Dementia Research at Nathan S. Kline Institute for Psychiatric Research.

Dr. Aine Duffy, a postdoctoral fellow in Dr. Scharfman's laboratory, created the illustration projected on the monitor. It is based on the brain of a transgenic mouse, which was obtained from Dr. Chao's laboratory.

$127.8 BILLION

or 1.2% of the U.S. gross domestic product in 2003: total U.S. costs associated with arthritis and other rheumatic conditions in 2003. Osteoarthritis accounted for most of these costs, as it is by far the most common form of arthritis. Source: Centers for Disease Control and Prevention

The musculoskeletal collaboration involves a broad multidisciplinary group from NYU Langone and New York University, including chemists, radiologists, and physicians. Shown clockwise from top left: MUKUNDAN GOPALAKRISHNAN ATTUR, PHD, assistant professor of medicine (Division of Rheumatology); STEVEN ABRAMSON, MD, vice dean for Education, Faculty and Academic Affairs; professor of medicine (Division of Rheumatology) and pathology; RAVINDER REGATTE, PHD, assistant professor of radiology; ALEXEJ JERSCHOW, PHD, associate professor of chemistry (NYU, Washington Square campus).

Still Dancing: Saving the Joints of Baby Boomers

Musculoskeletal Collaboration at NYU Langone

As baby boomers begin striding toward an active retirement, osteoarthritis of the knees, hips, and ankles is bringing many to a painful, grinding halt. Health experts have named the disease—caused by a breakdown of cartilage in the joints—as the single largest cause of disability in the industrialized world, and yet osteoarthritis remains poorly understood. "It's not in the spotlight because people don't die from it directly. They suffer a poor quality of life due to pain and disability," says Dr. Alexej Jerschow, a chemist based at the University's Washington Square campus and one of four collaborators hoping to pinpoint early diagnostic indicators for the debilitating disease.

"The central question we're trying to address in osteoarthritis is, Who's going to get worse?" says Dr. Steven Abramson, director, Division of Rheumatology, and co-director of the Center of Excellence in Musculoskeletal Disease. "The answer will enable new drug development," he says.

A reliable answer will be critical for avoiding unnecessary interventions while getting better therapies to those in need. Historically, it's been a frustrating question. "Currently, there is no single biomarker that can either identify osteoarthritis or predict progression of the disease," says Dr. Mukundan Attur, a molecular biologist. Clinicians commonly check for pain symptoms when evaluating patients. "But by the time you observe the pain, it's already in an advanced state," says Dr. Ravinder Regatte, an imaging specialist.

By instead looking at early biochemical changes in the soft tissue of the knee, the multidisciplinary collaborators are finding success in developing biomarkers that may predict osteoarthritis progression. Together, the four specialists are helping to identify noninvasive imaging techniques, genes newly linked to the disease pathway, and promising candidates for drug development. If their methods can be validated in patient populations at NYU Langone and other clinical sites, the hard work may help keep the majority of baby boomers and other Americans on their feet well into their golden years.

"From a public health point of view, osteoarthritis is probably the single largest cause of disability in the industrialized world."

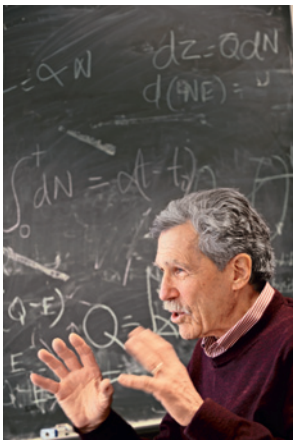
DR. STEVEN ABRAMSON

Researchers
Advancing
Knowledge

DISCOVERY

The next few pages highlight some of the outstanding science at NYU Langone Medical Center this past year, ranging from seminal work in genetics to battles against melanoma, heart disease, arthritis, and hospital-acquired infections.

Discovery	Passing Toxic Genes from One Bacterium to Another
Researcher	Richard P. Novick, MD
Research Center	The Helen L. and Martin S. Kimmel Center for Biology and Medicine at the Skirball Institute of Biomolecular Medicine
Publication	Chen J, Novick RP. Phage-mediated intergeneric transfer of toxin genes. *Science* 323 (2009): 139–141.



Dr. Richard Novick, a pioneering force in *Staphylococcus aureus* research, has discovered that bacteria-infecting viruses called bacteriophages are capable of shuttling genetic information between unrelated bacteria. Bacteriophages, he says, are ubiquitous on earth. "So even a very rare event, with that many candidates, could wreak havoc," he says.

A startling finding by Dr. Richard Novick and his team, published in *Science* in January 2009, showed that bacteriophages, viruses that infect only bacteria, are able to pass on *Staphylococcus aureus* toxin genes to unrelated bacteria. Previously, only extrachromosomal bits of DNA called plasmids were thought capable of transferring genes from one species to another. So Dr. Novick was surprised when his postdoctoral fellow, John Chen, PHD, found that a bacteriophage could shuttle the gene for toxic shock toxin from staph to *Listeria monocytogenes,* a foodborne pathogen.

Although the genetic transfer via bacteriophages has occurred only under lab conditions, both staph and *Listeria* can infect the udders of dairy cows, and experiments suggest the gene transfer can occur in raw milk, with unknown consequences. "One is always concerned about the possible evolution of a newer, nastier bug," Dr. Novick says. A bacteriophage delivery of other staph toxins to *Listeria,* especially the food-poisoning agent enterotoxin B, could be especially bad. "It could cause food poisoning as well as a separate foodborne infection," he says, "and that could be quite unpleasant."

Dr. Novick began studying staph nearly 50 years ago when scientists had just unveiled a new antibiotic named methicillin. Today, methicillin-resistant *Staphylococcus aureus* (or MRSA) is so widespread that researchers have linked the bacterial strain to 58 percent of the nearly 480,000 annual hospitalizations due to staph infections in the United States. With toxic shock syndrome, pneumonia, and food poisoning also in its repertoire, the notorious bug has mastered multiple ways of spreading misery.

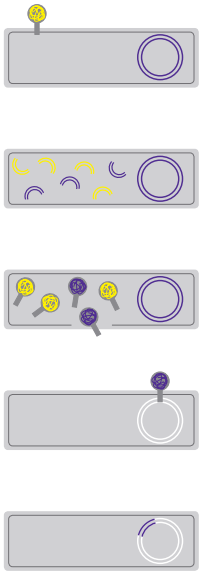
Dr. Novick's own war chest of knowledge, experience, and collaboration—plus a lab freezer filled with more than 11,000 bacterial strains—has long been put to good use cataloging how staph governs its own virulence, or capacity to cause disease. He and his team, for example, have unmasked a major contributor to staph's virulence, a genetic region named the accessory gene regulation (agr) system. They found that once an invading staph army reaches critical mass, the corresponding buildup of a peptide flips on the agr master switch. The result is an overwhelming show of force in the form of mass-produced toxins and other virulence factors. Preventing staph from flipping that switch might keep an infection at bay until the human immune system can join the fight.

477,927

Staph-related U.S. hospitalizations in 2005.

"One is always concerned about the possible evolution of a newer, nastier bug." DR. RICHARD NOVICK

Colorized scanning electron micrograph image of *Staphylococcus aureus* on membrane filter.



a. Phage infects *Staphylococcus aureus*

b. DNA from both phage and *Staphylococcus aureus* chromosome cut into lengths as a result of phage infection

c. DNA repackaged in new phage particles

d. Phage containing *Staphylococcus aureus* DNA infects *Listeria*

e. *Staphylococcus aureus* DNA from phage is incorporated into *Listeria* chromosome

Ferrying Genes

This five-step process shows how the toxic shock toxin from *Staphylococcus aureus* can be transferred to *Listeria monocytogenes* via a bacteria-infecting phage. After a phage invades a staph bacterium (a), both phage DNA (yellow) and bacterial DNA (purple) are cut up and processed (b). The bacterium's cellular machinery is hijacked by the phage to produce new copies of itself (c), but some copies now include bacterial DNA. When the same phage infects *Listeria* (d), it can introduce staph's toxic shock toxin gene, which incorporates into the *Listeria* chromosome (e).

Statistics source: Klein E, Smith D, and Laxminarayan R. Hospitalizations and deaths caused by methicillin-resistant *Staphylococcus aureus*, United States, 1999–2005. *Emerging Infectious Diseases* 13, no. 12 (December 2007).

Discovery	Leveraging the Body's Own Ability to Fight Cancer
Researcher	Nina Bhardwaj, MD, PhD
Research Program	Tumor Vaccine Program, Interdisciplinary Melanoma Cooperative Group, The Cancer Institute
Publication	Skoberne M, Yewdall A, Bahjat KS, Godefroy E, Lauer P, Lemmens E, Liu W, Luckett W, Leong M, Dubensky TW, Brockstedt DG, and Bhardwaj N. KBMA *Listeria monocytogenes* is an effective vector for DC-mediated induction of antitumor immunity. *Journal of Clinical Investigation* 118 (2008): 3990–4001.

"If you can boost immunity, you have the real potential to elevate the body's own cancer-fighting ability." DR. NINA BHARDWAJ

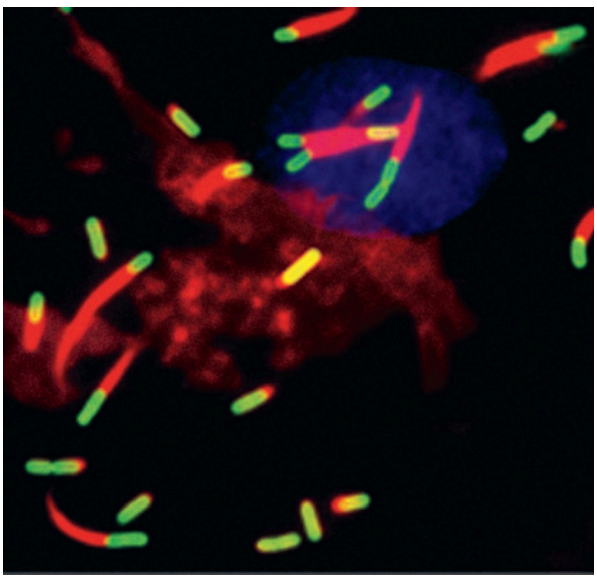
Goading the immune system into action is one promising approach to leveraging the body's own ability to fight off cancer. As reported in the December 1, 2008, issue of the *Journal of Clinical Investigation,* Dr. Nina Bhardwaj's team showed that mice infected with cancer benefited from an immune system–deceiving vaccine based on the foodborne pathogen *Listeria monocytogenes*.

Among Dr. Bhardwaj's many strategies to coax a more vigorous immune response for diseases such as melanoma, her group collaborated with a California biotech company to transform *Listeria* into a defanged courier bearing tumor antigens, or cancer-specific surface proteins. "The idea is that *Listeria,* which has a lot of components that will trigger an inflammatory response and subsequently an immune response, can be engineered to express antigens normally expressed by certain tumors," Bhardwaj says.

The activated immune system, including sentry-like dendritic cells that recruit multiple infection-fighters, gangs up on what seems to be a tumor, an action that may prime the pump for a forceful attack against the real thing. "If you can boost immunity," she says, "you have the real potential to elevate the body's own cancer-fighting ability." A similar vaccine strategy may be useful for far more than melanoma. "Besides cancer," she says, "I think there could be potential for using this for infectious diseases like HIV."

68,720

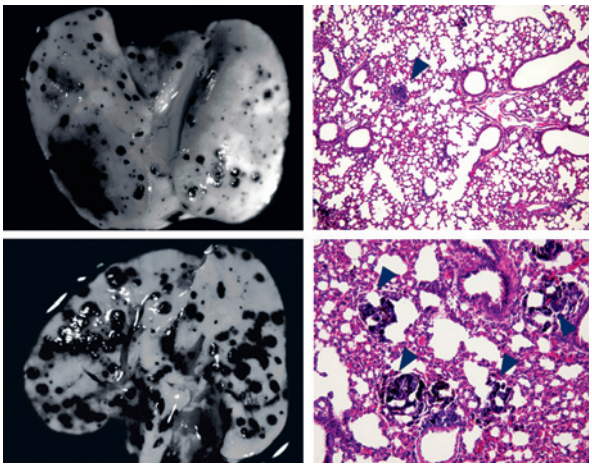
Estimate of new U.S. melanoma cases in 2009. Source: National Cancer Institute



Dr. Nina Bhardwaj's cancer vaccine strategy depends upon the immune system recognizing a weakened version of the foodborne pathogen *Listeria monocytogenes*. The colorful staining of these dendritic cells indicates that her reengineered *Listeria* can still activate the immune system.

Discovery	Searching for Melanoma's Achilles Heel
Researcher	Eva Hernando, PhD
Research Program	Interdisciplinary Melanoma Cooperative Group, The Cancer Institute
Publication	Segura MF, Hanniford D, Menendez S, Reavie L, Zou X, Alvarez-Diaz S, Zakrzewski J, Blochin E, Rose A, Bogunovic D, Polsky D, Wei J, Lee P, Belitskaya-Levy I, Bhardwaj N, Osman I, and Hernando E. Aberrant miR-182 expression promotes melanoma metastasis by repressing FOXO3 and microphthalmia-associated transcription factor. *PNAS* 106 (2009): 1814–1819.

Dr. Eva Hernando and colleagues found that the overproduction of a small RNA molecule, known as a microRNA, can enhance the invasion and migration of melanoma tumor cells in mice. The top panels show a biopsied section of a mouse melanoma tumor, at left, pigmented melanoma cells (the darker blue cells indicated by arrows in the magnified tissue section at far right) invading a mouse lung. With higher levels of the microRNA, the tumor cells more aggressively colonize a mouse lung, as indicated by the higher number of pigmented tumor cells in the panels below.



Some sleuthing by Dr. Eva Hernando and her team may help expose the genetic underpinnings of melanoma's aggressive and often fatal advance, which shuts down the body's defenses as it travels from site to site. Their work, published in a February 10, 2009, report in *Proceedings of the National Academy of Sciences,* showed that a master regulator of melanoma likely resides in an overlooked region of DNA once considered useless. "It's not junk DNA," Dr. Hernando says. "There is a lot of information there."

For starters, a small length of RNA encoded within that genetic region can switch off at least two genes that might otherwise block migrating tumor cells. "We think that this is a crucial mechanism for their ability to metastasize," she says. So far, lab and clinical tests suggest that more of the microRNA, as it's known, yields more invasive melanomas. Less of it seems to sap their power, however, offering hope that silencing the same master switch in cancer patients might help tame a malignant aggressor.

18%

The five-year survival rate for melanoma that has spread beyond the original area of skin to other organs or distant patches of skin. Source: American Cancer Society

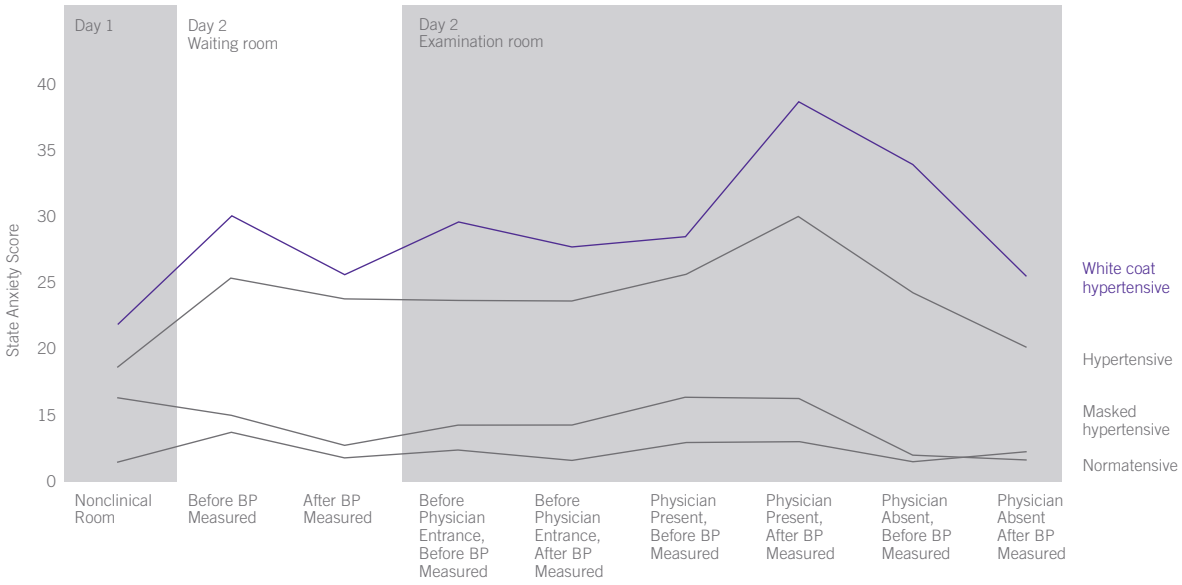
99%

The five-year survival rate for melanoma that is less than 1 millimeter in thickness, localized in the skin, and confined to the skin's upper dermis layer. Source: American Cancer Society

"We think that this is a crucial mechanism for their ability to metastasize." DR. EVA HERNANDO

Discovery	The Misdiagnosis of Hypertension
Researcher	Olugbenga Ogedegbe, ScD
Department	Medicine
Publication	Ogedegbe G, Pickering TG, Clemow L, Chaplin W, Spruill TM, Albanese GM, Eguchi K, Burg M, Gerin W. The misdiagnosis of hypertension: the role of patient anxiety. *Archives of Internal Medicine* 168 (2008): 2459–2465.

Mean visual analog scale scores before and after the physician's entrance to the examination room for the four diagnostic categories. BP indicates blood pressure.



High anxiety spurred by a visit to the doctor's office, shown in the graph above, can lead to deceptively high blood pressure readings for "white coat" hypertensive patients.

For many patients, a trip to the doctor's office can send their blood pressure soaring, even though it may be well below the danger zone the rest of the time. A study in the December 8, 2008, *Archives of Internal Medicine* by Dr. Olugbenga Ogedegbe and colleagues has now struck upon the likely reason behind this so-called "white coat" effect.

The spike in blood pressure, Dr. Ogedegbe says, appears to be a conditioned response to a particularly stressful experience, exacerbated in this case by a doctor measuring the patient's blood pressure within a clinic.

"A blood pressure measurement is crucial in trying to make a diagnosis for hypertension," he says. "And when we don't do it well, the result is 'white coat' hypertension." One side effect of the misdiagnosis, he says, may be the unnecessary medication of 10 to 20 percent of all patients thought to have high blood pressure, a leading risk factor for cardiovascular disease.

As a cost-effective solution, Dr. Ogedegbe has proposed expanding the use of home blood pressure monitors, whose readings can be captured electronically and uploaded later at a doctor's office. "If you measure blood pressure in the true environment of the patient," he says, "that's when we can know what their true blood pressure reading is."

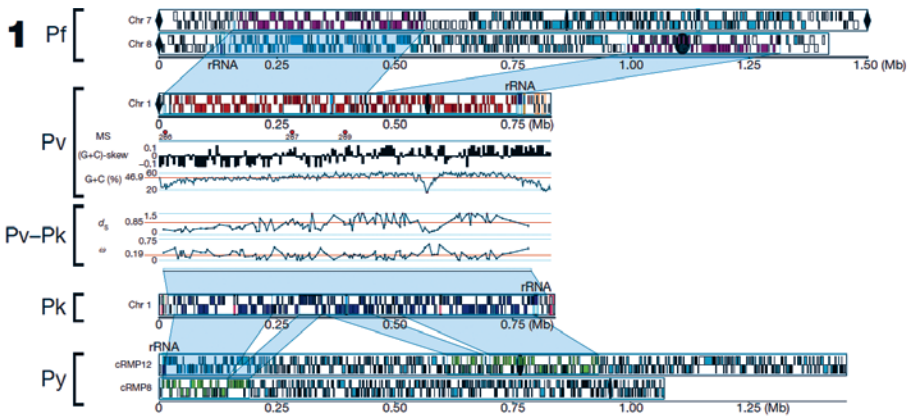
"A blood pressure measurement is crucial in trying to make a diagnosis for hypertension, and when we don't do it well, the result is 'white coat' hypertension." DR. OLUGBENGA OGEDEGBE

Discovery	Deciphering the Genetic Code of the Malaria Parasite
Researcher	Jane Carlton, PhD
Department	Medical Parasitology
Publication	Carlton JM, Adams JH, Silva JC, Bidwell S, Lorenzi H, Caler E, Crabtree J, Angiuoli SV, Merino EF, Amedeo P, Cheng Q, Coulson RMR, Crabb BS, Del Portillo HA, Essien K, Feldblyum TV, Fernandez-Becerra C, Gilson PR, Gueye AH, Guo X, Kang'a S, Kooij TWA, Korsinczky M, Meyer EVS, Nene V, Paulsen I, White O, Ralph SA, Ren Q, Sargeant TJ, Salzberg SL, Stoeckert CJ, Sullivan SA, Yamamoto MM, Hoffman SL, Wortman JR, Gardner MJ, Galinski MR, Barnwell JW, and Fraser-Liggett CM. Comparative genomics of the neglected human malaria parasite *Plasmodium vivax*. *Nature* 455 (2008): 757–763.

132 MILLION *to* 391 MILLION

Estimated range of annual worldwide malaria cases caused by *Plasmodium vivax*, accounting for 25 to 40 percent of the annual malaria burden. Source: Price, Ric N., et al. *American Journal of Tropical Medicine and Hygiene* 77, suppl. 6 (2007): 79.

"One genome is never enough." DR. JANE CARLTON



This "synteny map" is the first four-way comparison of malaria parasite species, and it shows that many genes are conserved in location among the species. Illustrated here is chromosome 1 of *P. vivax* with its equivalent in *P. falciparum* (Pf), *P. yoelii yoelii* (Py), and *P. knowlesi* (Pk). Colored boxes are genes, and colored lines represent conserved genes.

"One genome is never enough." So says parasitologist Dr. Jane Carlton, who has played a major role in deciphering the genetic code of more than a dozen microbes over the past decade. In 2008, she led a team of 40 collaborators from four continents for her latest landmark publication: an article and a cover in the October 9, 2008, *Nature* for the completed genome of the malaria parasite *Plasmodium vivax*.

Spelling out a parasite's entire DNA collection, no small feat for one with nearly 27 million letters, allows researchers to compare the genetic makeup of similar organisms and tease out targets for drugs and vaccines. Dr. Carlton's success means scientists now have the blueprint for a neglected malaria pathogen that is seldom fatal—unlike its deadlier sibling *Plasmodium falciparum*—but still sickens up to 391 million people every year, mostly in Asia and South America.

She and her colleagues discovered that both species share many "housekeeping" genes that control routine cellular functions. Because several drugs targeting those genes have shown promise against *Plasmodium falciparum*, she says, "we're thinking we'll be able to use some of those same drugs to target *Plasmodium vivax*, which would be great."

Discovery	The Role of T Cells in Immunity
Researcher	Dan Littman, MD, PhD
Research Center	Skirball Institute of Biomolecular Medicine
Publication	Zhou L, Lopes JE, Chong MMW, Ivanov II, Min R, Victora GD, Shen Y, Du J, Rubtsov YP, Rudensky AY, Ziegler SF, and Littman DR. TGF-beta-induced Foxp3 inhibits TH17 cell differentiation by antagonizing RORgammat function. *Nature* 453 (2008): 236–240.

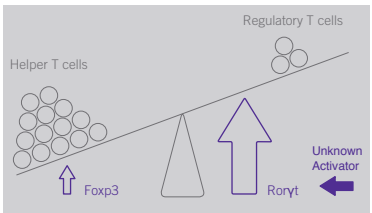
Dr. Dan Littman has long studied the early decision-making processes necessary for a properly balanced immune system. His groundbreaking research into how these decisions get made is clarifying the basis of several autoimmune diseases.

500,000

Estimated number of Americans living with Crohn's disease, a form of inflammatory bowel disease.

"If they're overexuberant, the TH17 cells can cause autoimmunity, but if they're depleted, the individual is going to be more susceptible to opportunistic infections." DR. DAN LITTMAN

As Foxp3 is activated, the balance of T cells is adjusted, producing more regulatory T cells and fewer helper T cells. This shift helps control inflammation but can impede the immune system's infection fighting if it goes too far.



Conversely, as Rorγt is activated, the balance shifts to produce more helper T cells. This shift helps boost the immune system's surveillance but can also lead to inflammation. Dr. Littman's team is now zeroing in on the identity of the unknown activator for Rorγt.

Statistics source: Loftus, CG. Update on the incidence and prevalence of Crohn's disease and ulcerative colitis in Olmsted County, Minnesota, 1940-2000 *Inflammatory Bowel Diseases* 13, no. 3 (2007): 254–261.

These colorful panels, from Dr. Littman's seminal *Nature* paper, depict the immune system's balancing act. Some of these stained T cells express high levels of a gene associated with regulatory T cell specialists (green arrows), while other cells express the competing regulator linked to inflammatory helper T cells known as TH17 cells (red arrows). In some cells (yellow arrow), both regulators are present.

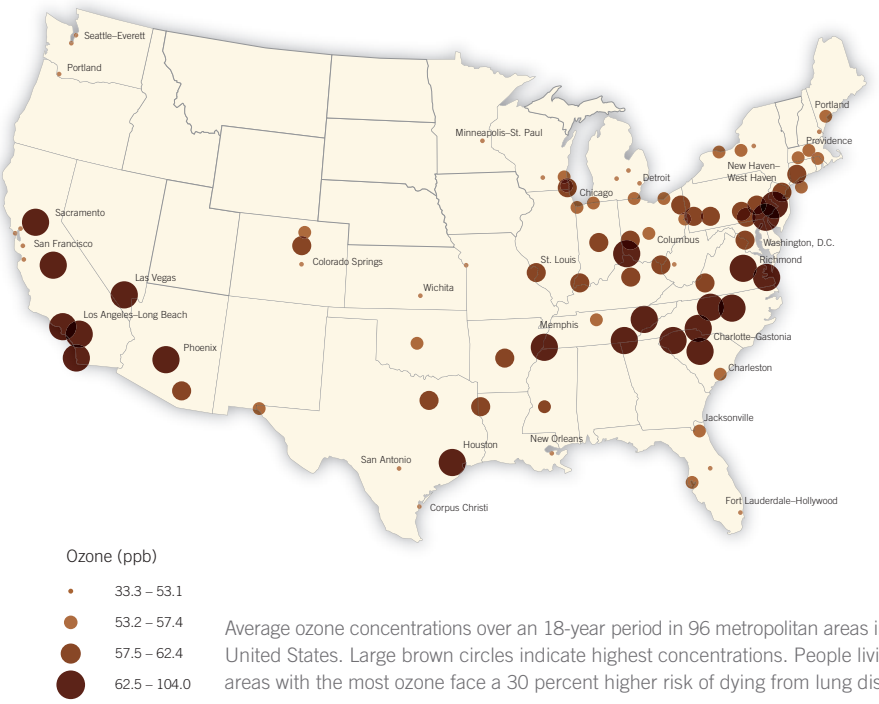
In a May 8, 2008, study in *Nature,* Dr. Dan Littman, the Helen L. and Martin S. Kimmel Professor of Molecular Immunology, and his colleagues defined a critical balancing act between two dueling directors of the immune system. Each favors the production of a different T cell specialist, and the functions of these two specialists are diametrically opposed. When one director comes out on top, Dr. Littman discovered, early immune cells become a type of helper T cell that can recognize invaders and summon help. If unrestrained, however, these same T cells can lead to harmful inflammation. When the competing control mechanism gains the upper hand, early immune cells instead turn into regulatory T cells, specialists that are essential for holding inflammation in check.

The immune system is full of these delicate balances, as Dr. Littman and his colleagues have found. An overactive helper T cell called TH17, for example, can cause autoimmune disorders like psoriasis, rheumatoid arthritis, and inflammatory bowel disease. "The genetic link really ties this pathway into human disease," Dr. Littman says. "If they're overexuberant, the cells can cause autoimmunity, but if they're depleted, the individual is going to be more susceptible to opportunistic infections."

More than a decade ago, Dr. Littman's team isolated a gene known as Rorγt that has since been pegged as a master switch for the inflammation-causing helper T cells. In mice, turning the gene off shuts down production of the T cells and alleviates autoimmunity.

His lab is now zeroing in on identifying the molecule that activates this master Rorγt switch. Knowing its identity, he says, "would give us the opportunity of manipulating the pathway, and that might give us some kind of therapeutic target." In other words, it could help restore some much-needed balance.

Discovery	The Deadly Effects of Ozone in Urban Areas
Researcher	George Thurston, ScD
Department	Environmental Medicine
Publication	Jerrett M, Burnett RT, Pope CA III, Ito K, Thurston G, Krewski D, Shi Y, Calle E, Thun M. Long-term ozone exposure and mortality. *The New England Journal of Medicine* 360 (2009): 1085–1095.

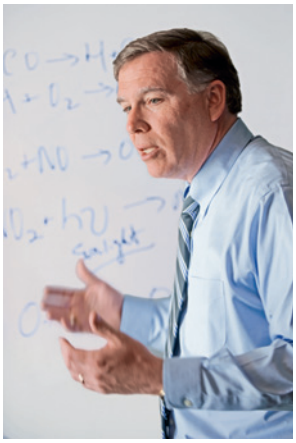


Average ozone concentrations over an 18-year period in 96 metropolitan areas in the United States. Large brown circles indicate highest concentrations. People living in areas with the most ozone face a 30 percent higher risk of dying from lung disease.

In a comprehensive analysis of the health records of nearly 450,000 Americans in 96 metropolitan regions, Dr. George Thurston and his team concluded that residents of cities with the most ozone face a 30% higher risk of pulmonary death than those from low-ozone cities. Their work was published in *The New England Journal of Medicine* on March 12, 2009.

In the lower atmosphere, ozone pollution forms when gases from power plants and other sources react with sunlight. In the body, ozone can eat away the lining of the lungs, leading to cumulative damage and death. Dr. Thurston and other NYU researchers have repeatedly tied the pollutant better known as smog to acute respiratory emergencies.

Dr. Thurston notes: "Most ozone originates upwind of cities like New York," he says, "so we don't really have control over our own destiny, especially in the summertime." He believes his team's new study, however, may persuade the EPA to establish long-sought annual limits for the gas and adopt a more regional approach toward controlling long-term exposure. "We could be entering a new era here in trying to deal with pollutants like ozone," he says.

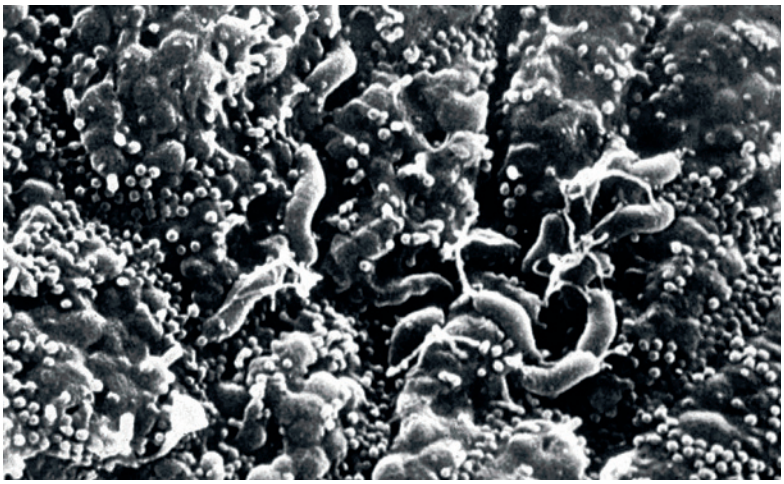


"We need a more regional approach toward controlling long-term—and very harmful—exposure to ozone." DR. GEORGE THURSTON

Discovery	Asthma Linked to Absence of Gut Microbe
Researcher	Martin Blaser, MD
Department	Medicine
Publication	Chen Y, Blaser MJ. *Helicobacter pylori* colonization is inversely associated with childhood asthma. *Journal of Infectious Diseases* 198 (2008): 553–560.

"*Helicobacter pylori* probably has certain early-life health benefits and late-in-life health costs." DR. MARTIN BLASER

Helicobacter pylori in the human stomach. The curved spiral bacterium has been colonizing our stomachs for tens of thousands of years. Due to widespread use of antibiotics and better sanitation, it is now disappearing among people in the industrialized world, potentially contributing to a rise in diseases such as asthma.



400
MILLION

Number of people around the world expected to have asthma by 2025, compared with 300 million in 2005. Source: World Health Organization

The rapid disappearance of a much-maligned stomach microbe blamed for ulcers, gastric disorders, and cancer might ordinarily be seen as good news. But the departure of *Helicobacter pylori* over the past few decades, perhaps due to antibiotic use, may carry a considerable downside: a rise in childhood-onset asthma and other allergies.

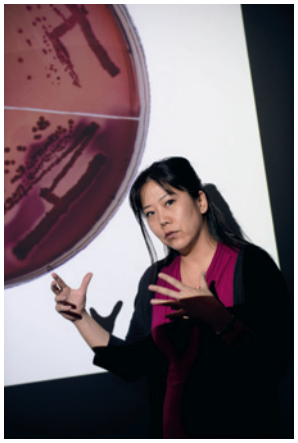
In three studies published in 2007 and 2008, Dr. Martin Blaser, the Frederick H. King Professor of Internal Medicine, and colleagues tied the absence of *Helicobacter pylori* to an increased risk for several allergy-associated ailments. A July 15, 2008, study of 7,000 children and adults published in the *Journal of Infectious Diseases* was the first to find that those who lacked the bacterium were more likely to have childhood asthma.

Much of the bacterium's bad rap is justified, Dr. Blaser says, but its presence also seems to spur the production of a certain type of infection-fighting T cells that protect against asthma. "If you don't have those T cells," he says, "then your response to allergens is different than if you did."

That difference may be particularly acute early in life. "Our current view," Dr. Blaser says, "is that *Helicobacter pylori* probably has certain early-life health benefits and late-in-life health costs." Continued work on the underlying mechanisms, he says, will help researchers understand why.

Discovery	How the TB Bacterium Disposes of Unwanted Proteins
Researcher	Heran Darwin, PhD
Department	Microbiology
Publication	Pearce MJ, Mintseris J, Ferreyra J, Gygi SP, and Darwin KH. Ubiquitin-like protein involved in the proteasome pathway of *Mycobacterium tuberculosis*. *Science* 322 (2008): 1104–1107.

A colorized microscopic image of *Mycobacterium tuberculosis*, the bacterium that causes TB.



"This study opens the door wide in terms of how we think about how bacteria do things and what that may mean for attacking disease." DR. HERAN DARWIN

9.27
MILLION

Estimated number of new cases of tuberculosis in 2007. Source: World Health Organization

Housekeeping genes in cells of humans and other organisms prevent the dangerous buildup of proteins by escorting unwanted proteins to a cellular trash disposal. In a new study published in the November 14, 2008, *Science*, Heran Darwin and colleagues identified such a housekeeping-like gene in *Mycobacterium tuberculosis* that encodes a protein called Pup.

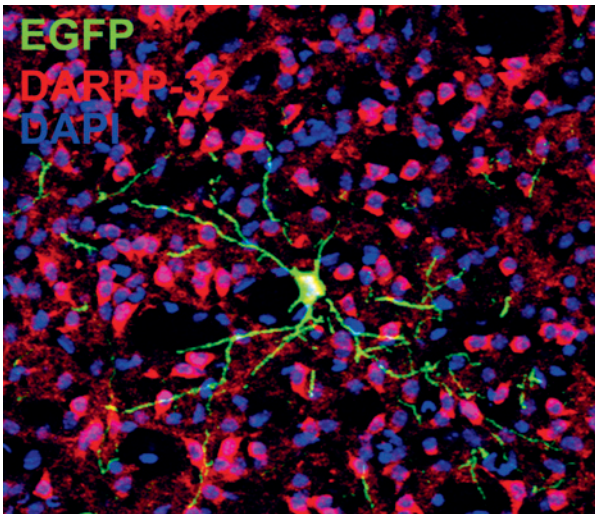
Drugs aimed at fouling up trash-disposal systems in disease-causing microbes have also been toxic to human cells, because of similarities between the human and microbial systems. But the Pup protein has a unique structure, which may offer a big advantage. "The idea is that because it's an analogue and not a homologue [functionally but not physically alike], the Pup protein may offer a better target for drug development."

Dr. Darwin thinks Pup could have a hand in controlling a wide array of other cellular functions, perhaps by binding up proteins at key moments or shepherding them to various parts of the cell. And where there's one, there may be others, both in *Mycobacterium tuberculosis* and other dangerous pathogens. "This study opens the door wide in terms of how we think about how bacteria do things," she says, "and what that may mean for attacking disease."

Discovery	Tackling Brain Dysfunction
Researcher	Gordon Fishell, PhD
Research Program	Smilow Neuroscience Program
Publication	Butt SJB, Sousa VH, Fuccillo MV, Hjerling-Leffler J, Miyoshi G, Kimura S, and Fishell G. The requirement of Nkx2–1 in the temporal specification of cortical interneuron subtypes. *Neuron* 59 (2008): 722–732.

"If we can fix [brain dysfunction] in a mouse, maybe the same logic will work in a human."

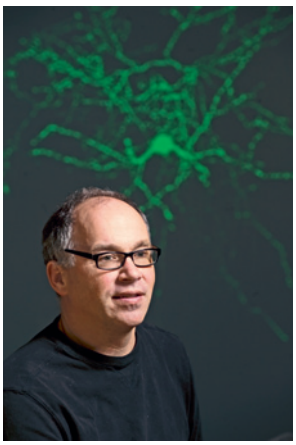
DR. GORDON FISHELL



Turning off a gene at a key time in development enabled a specialized neuron in the mouse brain to change its identity. It became a type of neuron that connects one region of the brain to another, as seen in the image above.

20–30

Number of kinds of specialized inhibitory neurons that control learning and memory in the brain. Source: Gordon Fishell



In a study published in the September 11, 2008, *Neuron*, Dr. Gordon Fishell and his colleagues silenced a mouse gene at a critical moment in the development of a specialized neuron. The cell switched course and became another type of neuron. "This implies that there are little programs that tell a cell what to be and certain genes act as toggle switches to select a program," he says. With the abrupt change in programming, the mice acquired severe epilepsy.

"Our idea is that each one of those neurons is like a kind of transistor in a computer that has a very specific function in the way you think and learn," he says. "If any one of those went wrong, you would have a specific kind of neural disease, like autism, epilepsy, bipolar disorder, or schizophrenia."

Modeling such diseases in mice, Dr. Fishell says, "gives us a very strong basis to start understanding how certain cells contribute to brain function." And brain dysfunction? "If we can fix that in a mouse, maybe the same logic will work in a human."

New Research Faculty 2008

NYU Langone Medical Center continues to attract the best and brightest faculty from around the world, researchers who share our passion, energy, and commitment to excellence.

LEORA B. BALSAM, MD, is an assistant professor of cardiothoracic surgery and an attending cardiac surgeon at NYU Langone Medical Center and Bellevue Hospital Center. Her research interests include cardiac repair, regeneration, and remodeling. Dr. Balsam received her medical degree from Harvard Medical School, and she was a Howard Hughes Medical Institute and National Institutes of Health Research Scholar, performing basic science research aimed at understanding the role of adaptor proteins in transcriptional regulation. She completed her internship, general surgery residency, cardiothoracic surgery residency, and research fellowship at Stanford Medical Center.

IRINA BARASH, MD, is an instructor in medicine in the Division of Nephrology. Her research interests include autosomal dominant polycystic kidney disease, a lethal, human genetic disease that affects 500,000 individuals in the United States. Her research is supported by a National Institute of Diabetes and Digestive and Kidney Diseases Ruth L. Kirschstein National Research Service Award, Individual Fellowship. She received her medical degree from SUNY Downstate Medical School and completed her residency in internal medicine and a fellowship in nephrology at Mount Sinai Medical Center.

HERSH CHANDARANA, MD, is an assistant professor of radiology and an attending in the Body and Cardiovascular Service at NYU Langone Medical Center and Bellevue Hospital. His research interests include the development and application of advanced and functional magnetic resonance (MR) techniques such as diffusion, perfusion, and blood-oxygenation-level-dependent (BOLD) imaging in the abdomen and pelvis. Dr. Chandarana completed his diagnostic radiology residency and body and cardiovascular magnetic resonance imaging (MRI) fellowship at NYU Langone.

BOUKE DE JONG, MD, PHD, is an assistant professor in the Department of Medicine, Division of Infectious Diseases and Immunology. Her research interests include the genetic diversity of mycobacteria and tuberculosis translational research. She completed her medical education at the University of Amsterdam, the University of Nevada, and Stanford University, and continues to conduct studies on human tuberculosis in The Gambia, West Africa.

CATHERINE S. MAGID DIEFENBACH, MD, is an assistant professor of medicine. Her clinical and translational research interest focuses on the identification of prognostic and therapeutic targets in patients with melanoma and ovarian cancer. She received her medical degree from the University of Pennsylvania School of Medicine, and completed her internal medicine residency at Johns Hopkins Hospital and her hematology-oncology fellowship at Memorial Sloan-Kettering Cancer Center.

STEVEN FLANAGAN, MD, is a professor in and chairman of the Department of Rehabilitation Medicine, and medical director of the Rusk Institute of Rehabilitation Medicine at NYU Langone Medical Center. His work focuses on brain injury rehabilitation. He received his medical degree from the University of Medicine and Dentistry of New Jersey. He completed his residency training in physical medicine and rehabilitation at Mount Sinai School of Medicine, where he served as chief resident during his last year of training. He was formerly the vice chair of the Department of Rehabilitation Medicine at Mount Sinai School of Medicine and the medical director of the Brain Injury Rehabilitation Program. He has served on medical advisory boards, including the Brain Trauma Foundation and the Indian Head Injury Foundation.

BOYCE E. GRIFFITH, PHD, is an assistant professor in the Leon H. Charney Division of Cardiology in the Department of Medicine. He uses methods of applied mathematics and computational science to develop computer simulations of biological systems, mainly in large-scale simulation of blood flow in the heart and of cardiac electrophysiology, and collaborates with researchers at NYU's Courant Institute of Mathematical Sciences. He received his PHD in mathematics from NYU and completed postdoctoral work in mathematics and cardiac physiology modeling at NYU.

RICHARD B. HAYES, DDS, PHD, MPH, is the director of the Division of Epidemiology within the Department of Environmental Medicine, and associate director for population sciences at NYU Langone Medical Center's Cancer Institute. Before coming to NYU Langone, he was a senior investigator in the National Cancer Institute's Intramural Research Program in the Division of Cancer Epidemiology and Genetics, where he led epidemiologic investigations on prostate cancer and colorectal tumors, and on occupational exposures in relation to leukemia. At NYU Langone, he plans to expand the cancer epidemiology research program, with a focus on discovery of the genetic determinants of cancer and their interplay with environmental factors. He also plans to support the development of population sciences at The Cancer Institute. He received his DDS from Columbia University and his MPH and PHD in epidemiology from Johns Hopkins University.

MAYUMI ITO, PHD, is an assistant professor of dermatology and cell biology. Her research focuses on understanding cellular and molecular mechanisms controlling stem cells residing in adult hair follicles. Her work has shown that epithelial and melanocyte stem cells significantly contribute to cutaneous wound healing. She received her PHD in biology from Nagoya University in Japan and was a postdoctoral research fellow in dermatology at the University of Pennsylvania School of Medicine.

S. GENE KIM, PHD, is an assistant professor in the Department of Radiology. His research interests include the development of diffusion, perfusion, and chemical shift MRI methods to probe tumor microenvironments associated with therapeutic response. He received his PHD from the University of Southern California, Los Angeles, and was a postdoctoral researcher in the Department of Rehabilitation Medicine at the NIH Clinical Center, and a postdoctoral researcher and research associate in the Department of Radiology at the University of Pennsylvania.

IRYNA LOBACH, PHD, is an assistant professor of environmental medicine in the Division of Biostatistics and a member of the Biostatistics Shared Resource of The Cancer Institute. She is the faculty statistician for the Divisions of General Internal Medicine and Cardiology in the Department of Medicine. She is especially interested in genetic and nutritional epidemiology and is developing statistical and computational methods for association analysis of complex diseases, such as cancer, hypertension, and diabetes. She received her PHD in statistics from Texas A&M and recently completed postdoctoral training at Yale University in genetic epidemiology.

ACHIAU LUDOMIRSKY, MD, is the director of the Division of Pediatric Cardiology and a professor of pediatrics. Dr. Ludomirsky is an internationally renowned pediatric cardiologist and a pioneer in fetal and pediatric heart imaging. He had an instrumental role in the development of novel imaging and therapeutic procedures for children with congenital heart disease. He earned his medical degree at the Sackler Medical School at Tel Aviv University in Israel. He then served as a major and a physician in the research and development branch of the Medical Corps of the Israel Defense Forces. He completed residency in general pediatrics at Hadassah Hospital in Jerusalem, followed by a fellowship in pediatric cardiology at Baylor College of Medicine in Houston.

CHEONGEUN OH, PHD, is an assistant professor in the Department of Environmental Medicine. Her research interests include the development of mathematical, statistical, and computational methods to address scientific questions raised in molecular biology and genetics. She received her PHD in applied mathematics and statistics from the State University of New York (SUNY) at Stony Brook and was a biostatistician in the Department of Preventive Medicine at SUNY Stony Brook, a postdoctoral associate in epidemiology and public health at Yale University, an assistant professor in the Department of Preventive Medicine, and an assistant professor of Public Health at the University of Medicine and Dentistry in New Jersey.

PATRICK ALEXANDER OTT, MD, PHD, is an assistant professor of medicine and an attending medical oncologist at The Cancer Institute. His research interest is in melanoma vaccine development and the impact of oncogenic signaling pathways on the function of dendritic cells, particularly melanoma. He received his medical degree and his PHD from the Ludwig Maximilians University of Munich in Germany. He was a research fellow and an intern and resident in medicine at the University Hospitals of Cleveland/Case Western Reserve University and a clinical fellow in medicine in the Divisions of Hematology and Medical Oncology at NYU School of Medicine.

VICTOR J. TORRES, PHD, is an assistant professor in the Department of Microbiology. He is investigating how different host environments affect the expression of staphylococcal virulence factors and how these virulence factors interfere with the host immune system to promote disease. He received his PHD from Vanderbilt University School of Medicine, where he completed postdoctoral work in infectious diseases and microbial pathogenesis.

YUDONG ZHU, PHD, is an assistant professor in the Department of Radiology. He is leading work in the new field of parallel radio-frequency transmission, which has already had a worldwide impact on MR scanner instrumentation and high-field MR imaging. His current research focuses on advancing high-field MR applications with innovative MR signal creation and detection methods. He received his PHD in electrical engineering from Stanford University, where he completed his postdoctoral MRI fellowship in the Department of Radiology. He was previously a senior staff scientist in the MRI lab at the GE Global Research Center.

HORACIO KAUFMANN, MD, is the Felicia B. Axelrod Professor of Dysautonomia Research and professor of medicine, pediatrics, and neurology. An eminent specialist in a rare genetic disorder of the autonomic nervous system that occurs in the Ashkenazi Jewish population, Dr. Kaufmann received his medical degree from the University of Buenos Aires.

Dr. Kaufmann, appointed in October 2007, was inadvertently omitted from last year's research report.

The following faculty joined NYU Langone Medical Center in 2008. Summaries of their careers were published in last year's annual research report.

CONSTANTIN F. ALIFERIS, MD, PHD, director of the Center for Health Informatics and Bioinformatics and associate professor of pathology.

MARY HELEN BARCELLOS-HOFF, PHD, associate professor in the Departments of Radiation Oncology and Cell Biology.

ORALEE BRANCH, PHD, assistant professor in the Department of Medical Parasitology.

HAROLD BREM, MD, chief of the Division of Wound Healing and Regenerative Medicine in the Department of Surgery and associate professor of surgery.

STUART KATZ, MD, director of the Heart Failure Program in the Leon H. Charney Division of Cardiology, and the Helen L. and Martin S. Kimmel Professor of Advanced Cardiac Therapeutics in the Department of Medicine.

THORSTEN KIRSCH, PHD, professor of orthopaedic surgery and cell biology, vice chair for research in the Department of Orthopaedic Surgery, and director of the Musculoskeletal Research Center.

HOLGER KNAUT, PHD, assistant professor of cell biology and a member of the Skirball Institute of Biomolecular Medicine.

CATHERINE SCOTT MANNO, MD, the Pat and John Rosenwald Professor of Pediatrics and chair of the Department of Pediatrics.

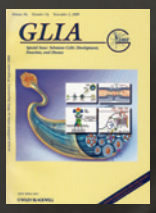
OLUGBENGA OGEDEGBE, MD, associate professor of medicine and director of the Center for Healthful Behavior Change in the Division of General Internal Medicine.

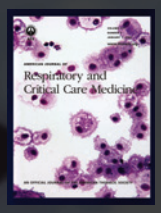
SILVIA G. PRIORI, MD, PHD, professor of medicine and director of the Cardiovascular Genetics Program at the Leon H. Charney Division of Cardiology.

MICHAEL P. RECHT, MD, the Louis Marx Professor of Radiology and chairman of the Department of Radiology.

GREG SEONG-BAE SUH, PHD, assistant professor of cell biology and a member of the Molecular Neurobiology Program at the Skirball Institute of Biomolecular Medicine.

Published Research 2008





Our faculty members publish their research widely in the peer-reviewed scientific and medical literature, the yardstick by which scientific work is judged. In this section, we highlight some of the more than 4,000 research publications that featured NYU Langone Medical Center researchers in 2008. Faculty members are in blue type. Listed are papers that appeared in the most widely cited scientific and medical journals, such as *Science*, *Nature*, *JAMA*, and *The New England Journal of Medicine*. The list samples just some of the important work that our scientists perform. Many other outstanding papers are published in journals that, directed to specialized audiences, have high impact within their fields.

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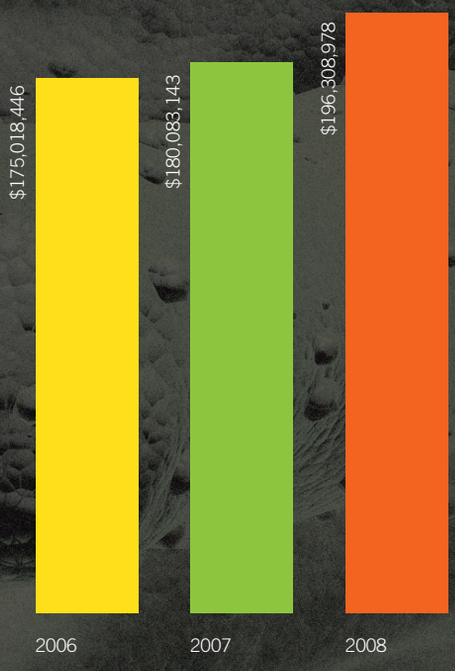
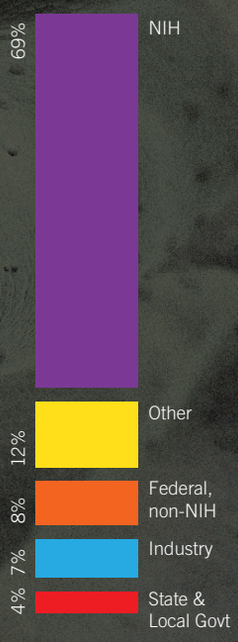
Funding

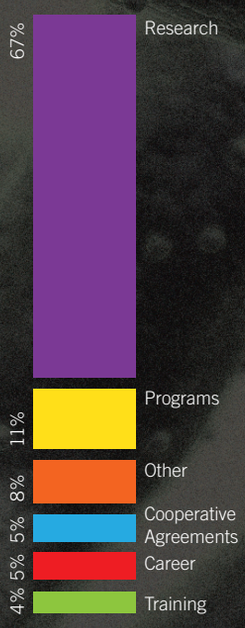
Fiscal Year 2008



Total Grant Revenue for 2006–2008



Sponsor Types for Research in 2008



Distribution of NIH Awards in 2008

New 2008 Federal Funding* (over $100,000)

JUDITH A. ABERG Adult AIDS Clinical Trials Unit *National Institutes of Health (NIH)* $9,741,549

HOWARD B. ABIKOFF Home-based parent training in ADHD preschoolers *NIH* $3,419,276

SYLVIA ADAMS Augmenting cancer vaccine therapy with TLR9 agonists *NIH* $691,740

IANNIS AIFANTIS The pre-TCR as an inducer of cell survival and transformation *NIH* $505,782

LEON AXEL Quantitative myocardial perfusion assessment with MRI *NIH* $2,764,699

INDU A. AYAPPA Relating sleep-disordered breathing to daytime function *NIH* $2,063,492

MARY HELEN BARCELLOS-HOFF Integrative radiation biology *Department of Energy* $2,801,000

DAFNA BAR-SAGI Mechanisms of signal transduction by Ras proteins *NIH* $1,044,145

DAFNA BAR-SAGI Positive and negative regulation of RTK-Ras signaling *NIH* $1,286,775

JOEL G. BELASCO Mechanisms of gene regulation by microRNAs *NIH* $1,151,750

NINA BHARDWAJ Modulating immunity through dendritic cell phagocytic receptors *NIH* $1,694,791

KAREN L. BREWER Creating a health information community *NIH* $3,699,110

LAURIE MILLER BROTMAN Preventing conduct problems in poor, urban preschoolers *NIH* $2,157,210

JANE M. CARLTON Promotion of plasmodium research and training in India *NIH* $667,500

FRANCISCO XAVIER CASTELLANOS Neural substrates of variability in ADHD *NIH* $1,718,575

PAMELA COWIN The role of a novel adhesion GPCR in mammary stem cells *NIH* $419,278

BRUCE NEIL CRONSTEIN Purinergic regulation of bone metabolism *NIH* $1,864,316

KATERINA HERAN DARWIN Virulence regulation by the *Mycobacterium tuberculosis* proteasome *NIH* $1,906,250

RAMANUJ DASGUPTA A novel screen for small molecule modulators of the Wnt/wingless signaling pathway *DOD* $126,750

RAMANUJ DASGUPTA Integration of RNAi, proteomic, and chemical genetic approaches to identify specific modulators of Wnt/B-catenin signaling *NIH* $455,350

BOUKE CATHERINE DE JONG Genomic and immunological comparisons of *M. africanum* and *M. tuberculosis NIH* $359,529

SANDRA DEMARIA Local radiation as an adjuvant for immunotherapy *NIH* $1,223,790

MICHAEL L. DUSTIN Inverted two-photon laser scanning microscope for host defense *NIH* $500,000

ADRIAN I. ERLEBACHER Dendritic cell behavior at the maternal/fetal interface *NIH* $1,598,565

STEFAN FESKE Characterization of genes responsible for store-operated Ca2+ entry in T cells *NIH* $1,497,933

GLENN FISHMAN Connexin43 regulation and cardiovascular function *NIH* $1,676,500

VILMA GABBAY The neurobiology of adolescent depression *NIH* $1,081,214

TERRY GORDON Aquatic toxicity of waste stream nanoparticles *EPA* $399,828

MARC N. GOUREVITCH Substance abuse research education and training *NIH* $1,523,222

JEFFREY D. GREENBERG Prognostic genetic biomarkers in rheumatoid arthritis *NIH* $664,740

JOSEPH A. HELPERN Quantitative MRI of iron homeostasis, atrophy, and tissue structure in AB brain *NIH* $2,454,371

CATARINA E. HIOE HIV env-mediated synapse and signaling *NIH* $460,991

GEORGE G. HOLZ Molecular basis of antidiabetogenic hormone action *NIH* $1,184,969

KYONSOO HONG Activity-dependent growth cone guidance *NIH* $1,847,642

YOSHIHIKO HOSHINO RNA editing and its inhibition of HIV-1 replication in human macrophage *NIH* $416,374

XI HUANG Role of estrogen and iron in breast cancer *NIH* $372,300

JANE HUBBARD Control of onset of meiosis in *C. elegans NIH* $649,782

KONSTANTIN ICHTCHENKO Botulinum neurotoxin derivatives for targeted neuronal delivery *NIH* $452,386

KAZUHIKO ITO Real-time modeling of weather, air pollution, and health outcome indicator in NYC *Environmental Protection Agency (EPA)* $171,340

RUSSELL JOFFE Subclinical hypothyroidism: mood, cognition, and the effects of L-thyroxine treatment *NIH* $2,787,779

GLYN JOHNSON Dynamic 3HE MRI of the lungs *NIH* $465,114

STUART D. KATZ Studies on serial phlebotomy in voluntary blood donors *NIH* $1,906,688

THORSTEN KIRSCH Collagen-annexin interactions in tissue mineralization *NIH* $215,235

THORSTEN KIRSCH Regulation of tissue mineralization in skeletal tissues *NIH* $543,052

DAVID L. KLEINBERG Breast cancer chemoprevention by SOM230, an IGF-1 action inhibitor *United States Army Medical Research and Materiel Command* $842,733

MICHELLE KROGSGAARD Visualizing ligand-induced signal propagation in the TCR-signaling complex *NIH* $1,355,917

*Fiscal year, September 1, 2007 to August 31, 2008.

NATHANIEL LANDAU APOBEC3G/CEM15 inhibition of lentivirus replication *NIH* $851,956

NATHANIEL LANDAU Identification of Trim5 alpha cofactors *NIH* $468,499

NATHANIEL LANDAU Vpr revisited *NIH* $1,694,063

ERIC J. LANG Abnormal olivocerebellar synchrony: a possible cause of alcohol withdrawal tremor *NIH* $438,107

JOSHUA D. LEE Treatment study using depot naltrexone (3/6), NYU/Bellevue protocol treatment site *NIH* $1,903,564

PENG LEE Physician research training: distinct regulation of prostate cancer growth by two isoforms of androgen *Department of Defense—Army* $699,995

VIVIAN S. LEE Non-contrast-enhanced peripheral MR angiography *NIH* $3,908,324

CHUANJU LIU Degradative COMP fragments as a biomarker of arthritis *NIH* $637,740

CHRISTOPHER P. LUCAS Prevention of anxiety in high-risk preschool children *NIH* $1,015,126

DOLORES MALASPINA Jerusalem perinatal schizophrenia cohort study II *NIH* $3,771,237

DOLORES MALASPINA Olfactory and social function in schizophrenia *NIH* $656,205

IAN J. MOHR Virus host interactions that regulate translation in cells infected with HSV-1 *NIH* $2,118,541

LISA MOSCONI Family history of Alzheimer's hypometabolism and oxidative stress *NIH* $457,459

JEREMY F. NANCE Mechanisms of contact-mediated cell polarization in the *C. elegans* embryo *NIH* $1,439,616

THOMAS A. NEUBERT Triple quadruple (Q-trap) mass spectrometer *NIH* $413,850

ANNA NOLAN CD80 and CD86 mediated innate immune responses in sepsis *NIH* $795,690

MARK OPLER Paternal germ line effects and the risk of schizophrenia in offspring *NIH* $784,843

HARRY OSTRER Genome-wide association study to identify SNPs and CNPs associated with development of radiation injury in prostate cancer patients treated with radiotherapy *DOD* $608,140

MICHELE PAGANO Novel substrates of SCF ubiquitin ligases in cell cycle control and cancer *NIH* $350,825

GIUSEPPE PINTUCCI Proteolysis of HMW FGF-2 by thrombin and its cardiovascular implications *NIH* $381,865

RAVINDER R. REGATTE Quantitative MRI for early diagnosis of arthritis *NIH* $1,791,459

MALCOLM S. REID Phase II clinical trial with bupropion for methamphetamine dependence (task order number 4) *NIH* $736,266

ALCIBIADES J. RODRIGUEZ Sleep bruxism and central sensitization in myofascial face pain *NIH* $258,134

ANA RODRIGUEZ New plasmodium strategies to modulate inflammation *NIH* $423,646

WILLIAM N. ROM Longitudinal studies of HIV-associated bacterial pneumonia *NIH* $3,978,959

AGUEDA A. ROSTAGNO-GHISO Cerebrovascular amyloidosis, stroke, and dementia *NIH* $1,482,760

JOHN ROTROSEN Multisite controlled trial of cocaine vaccine (5 of 6), NYU treatment site *NIH* $1,253,875

HYUNG RYOO Coordination of apoptosis and cell proliferation through Diap1 and reaper *NIH* $1,186,427

MARTIN SADOWSKI Targeting the apoE/Abeta interaction as a novel AD therapy *NIH* $1,597,926

EINAR M. SIGURDSSON Clearance and in vivo detection of pathological tau conformers *NIH* $1,730,934

EINAR M. SIGURDSSON Immunotherapy for pancreatic amylin deposits in diabetes *NIH* $459,680

JANE SKOK Coordination of immunoglobulin gene recombination *NIH* $1,695,000

EDWARD Y. SKOLNIK The role of the calcium-activated potassium channel *NIH* $465,209

SUSAN L. SMITH Mechanisms of sister telomere cohesion and resolution *NIH* $1,608,825

DANIEL SODICKSON Parallel MR imaging: new techniques and technologies *NIH* $274,279

KATHLENE TRACY Mentorship for alcohol problems *NIH* $1,140,750

JESSICA E. TREISMAN Lipid modification of secreted signaling proteins *NIH* $465,916

DANIEL H. TURNBULL Molecular UBM and MRI of mouse vascular development *NIH* $1,658,177

DERYA UNUTMAZ Immunobiology of regulatory T cells in HIV infection *NIH* $1,561,336

BELA VOLGYI Structure and function of retinal ganglion cell gap junctions *NIH* $1,535,627

STEPHEN D. WALL Spanish and English multimedia intervention to increase organ and tissue donation *Agency for Healthcare Research and Quality (AHRQ)* $529,541

DA-NENG WANG Structural and mechanistic characterization of neurotransmitter reuptake inhibition *NIH* $1,906,782

DONALD WILSON Cortical processing of olfactory stimuli *NIH* $1,289,394

LILI YAMASAKI Mouse models for pRB growth control via E2F/DP action *NIH* $1,023,223

SONDRA R. ZABAR Medical residency training in primary care *HRSA/Bureau of Health Professions* $413,892

New 2008 Nonfederal Funding* (over $100,000)

STEVEN B. ABRAMSON Identification and characterization of drug targets in OA *Daiichi Pharmaceuticals* $600,000

STEVEN B. ABRAMSON Stem cell regeneration of articular cartilage *William and Lynda Steere Foundation* $1,000,000

IANNIS AIFANTIS Molecular regulation of CNS involvement in pediatric ALL *Alex's Lemonade Stand Foundation for Childhood Cancer* $200,000

IANNIS AIFANTIS Notch and NF-KB signaling *Helen Hay Whitney Foundation* $132,000

IANNIS AIFANTIS The SCF(FBW7) ubiquitin ligase complex as a tumor suppressor in T cell leukemia *The Leukemia and Lymphoma Society* $550,000

FELICIA AXELROD Dysautonomia Treatment Evaluation Center *Dysautonomia Foundation, Inc.* $506,230

ERIKA BACH Elucidating the molecular mechanisms that regulate stem cell number in vivo *American Cancer Society, Inc.* $900,000

NINA BHARDWAJ Randomized, double-blind, placebo-controlled study of topical resiquimod as an adjuvant for NY-ESO-1 protein vaccination in patients with tumors that often express NY-ESO-1 *Cancer Research Institute, Inc.* $403,430

MARTIN J. BLASER Diane Belfer Program in Human Microbial Ecology in Health and Disease *Diane Belfer* $500,000

MARTIN J. BLASER NYU-L'Oreal projects on human skin microbiota *L'Oréal USA* $142,500

PETER BROOKS Enhancing anti-tumor activity *The Chemotherapy Foundation* $130,000

STEVEN J. BURDEN The role of SMN in skeletal muscle development *Spinal Muscular Atrophy Foundation* $179,200

JILL P. BUYON Preventive intravenous immuno globulin therapy for congenital heart block *Alliance for Lupus Research* $427,550

ESTHER J. CALZADA A cultural model of mental health services for immigrant AfroCaribbean children *Robert Wood Johnson Foundation* $300,000

RONALD E. CARR Study of retinal degenerative diseases *Foundation Fighting Blindness* $587,000

FRANCISCO XAVIER CASTELLANOS High-throughput neuroimaging of pediatric neuropsychiatric disorders *Stavros S. Niarchos Foundation* $375,000

ANTONIO J. CONVIT BODY Project (Banishing Obesity and Diabetes in Youth) *WellPoint Foundation* $250,000

ANTONIO J. CONVIT BODY Project (Banishing Obesity and Diabetes in Youth) *Dr. Robert C. and Veronica Atkins Foundation* $100,000

ANDREW J. DARWIN Mechanisms of pseudomonas aeruginosa tolerance to secretin-induced stress during host infection *Burroughs Wellcome Fund* $500,000

JEREMY DASEN Role of hox proteins in sensory-motor neuronal connectivity and identity *Burroughs Wellcome Fund* $384,000

KAREN P. DAY Ellison Medical Foundation Senior Scholar in Global Infectious Disease Award *Ellison Medical Foundation* $1,000,000

SANDRA DEMARIA Local radiation and CTLA-4 blockade for metastatic breast cancer *American Cancer Society, Inc.* $720,000

SANDRA DEMARIA Use of chemo-radiation therapy to elicit anti-tumor immunity *Chemotherapy Foundation* $100,000

LUDOVIC DERIANO Defining alternative pathways *The Leukemia and Lymphoma Society* $150,000

ALESSANDRO DI ROCCO The NYU Parkinson and Movement Disorder Center *Edmond J. Safra Philanthropic Foundation* $944,000

BRIAN D. DYNLACHT The role of CP110 and associated proteins in primary cila assembly and disassembly *March of Dimes Birth Defects Foundation* $308,880

ANNA FERRARI Prostate cancer research *The Chemotherapy Foundation* $125,000

STEFAN FESKE Characterization of the role of novel protein Orai1 in store-operated calcium entry and CRAC channel function in primary immunodeficiency *March of Dimes Birth Defects Foundation* $239,170

GORDON J. FISHELL Generation of genetic models of autism in mice *The Simons Foundation* $240,000

SILVIA C. FORMENTI Preclinical studies of local ionizing radiation therapy and 4-1BB-mediated costimulation *Bristol-Myers Squibb* $106,470

SILVIA C. FORMENTI AND ROBERT J. SCHNEIDER Genetic and molecular markers for targeted treatment of locally advanced breast cancer *Breast Cancer Research Foundation* $250,000

THOMAS FRANKE AKT action in neuropsychiatric disorder *G. Harold & Leila Y. Mathers Foundation* $659,999

UTE FREVERT Cerebral malaria: immune cell and parasite interactions *The Dana Foundation* $200,000

MARC GALANTER Training physicians on the role of spirituality in the treatment of substance abuse *John Templeton Foundation* $570,810

WEN-BIAO GAN The role of microglial activation in synaptic pathology *Fidelity Foundation* $243,120

WEN-BIAO GAN AND MICHAEL L. DUSTIN Imaging immune cell infiltration and function in brain injury *The Dana Foundation* $200,000

FRANCESCA GANY Remote simultaneous medical interpreting: assessing medical outcomes, phase 2 *The Commonwealth Fund* $235,000

LAWRENCE GARDNER Erythroid gene regulation by nonsense mediated RNA decay *The New York Community Trust/ Frances Florio Fund* $100,000

JEFFREY D. GREENBERG Pharmacoepidemiology and pharmacogenetics of TNF antagonists *Arthritis Foundation* $500,000

*Fiscal year, September 1, 2007 to August 31, 2008.

JEFFREY D. GREENBERG Pharmacogenomic and proteomic biomarkers of rheumatoid arthritis therapeutics *Bristol-Myers Squibb* $209,300

JOSEPH A. HELPERN Quantitative MRI assessment of the biophysical environment of the Alzheimer's brain. *The Litwin Foundation* $2,024,680

EVA HERNANDO Mechanisms of mesenchymal transformation and leiomyosarcoma-genesis *American Cancer Society, Inc.* $716,000

EVA HERNANDO miRNA expression profiling of melanoma stem cells *Concern Foundation* $100,000

EVA HERNANDO Role of altered microRNAs in melanoma-genesis and progression *Elsa U. Pardee Foundation* $106,660

HORACIO KAUFMANN Dysautonomia research laboratory *Dysautonomia Foundation, Inc.* $290,400

ANA C. KRIEGER Endothelial cell dysfunction in sleep apnea *Robert Wood Johnson Foundation* $416,560

JUAN J. LAFAILLE Homing of MBP-specific T cells to different regions of the central nervous system *National Multiple Sclerosis Society* $473,440

JUAN J. LAFAILLE Sequence of events leading to the development and regulation of spontaneous EAE *National Multiple Sclerosis Society* $585,900

JUAN J. LAFAILLE Improving the efficacy of regulatory T cells in inflammatory bowel disease *Crohn's & Colitis Foundation of America* $429,000

VIVIAN S. LEE Understanding the role of contrast agents in diagnostic imaging *Berlex Laboratories* $366,000

RUTH LEHMANN Study of the sarcoma progression by using mouse models and in vitro manipulation of mesenchymal stem cells *NYS DOH* $553,560

HERBERT LEPOR Prostate cancer research program *Thomas H. Lee and Ann Tenenbaum* $175,000

HERBERT LEPOR Urologic oncology research *David Walentas* $1,000,000

DAN R. LITTMAN Core research *Alice and Tom Tisch* $2,500,000

DAN R. LITTMAN Dendritic cell function in asthma pathogenesis *Sandler Family Supporting Foundation* $750,000

DAN R. LITTMAN Regulation of Th17 cells and regulatory T cells in EAE *National Multiple Sclerosis Society* $439,510

DAN R. LITTMAN Studies on molecular mechanisms of lineage commitment of T lymphocytes *The Leukemia and Lymphoma Society* $135,000

DAN R. LITTMAN TH-POK Expression for regulation of TH-POK expression *The Leukemia and Lymphoma Society* $100,000

DAN R. LITTMAN AND JUN R. HUH Study of the epigentic nature of CD4 silencing in fully committed cytotoxic T cells *Jane Coffin Childs Memorial Fund for Medical Research* $107,000

RODOLFO LLINAS Brain machine interface systems *Neuro Interface, LLC* $280,000

RODOLFO LLINAS Chip project *Neurocontrol Systems, LLC* $600,000

RODOLFO LLINAS Methods and systems for diagnosing and treating thalamocortical dysrhythmia and the use of Octanol and related compounds to treat thalamocortical dysrhythmias *NeuroResonance LLC* $885,220

DANIEL MERUELO Lamin receptors as a pathway to effective prevention and treatment of Alzheimer's *The Litwin Foundation* $5,486,510

MULTIPLE INVESTIGATORS: BRIAN DYNLACHT, STEVAN R. HUBBARD, IAN J. MOHR, ANA RODRIGUEZ, ERIC J. LANG, JOHN S. MUNGER, MICHAEL POLES Research *Irma T. Hirschl Trust* $330,000

MULTIPLE INVESTIGATORS UNDER THE DIRECTION OF GLENN FISHMAN The Stanley Allan Isenberg, MD '43 Research Fund (Cardiovascular) *The Estate of Stanley Allan Isenberg* $9,500,000

MULTIPLE INVESTIGATORS UNDER THE DIRECTION OF H. LEON PACHTER NYU Institute for Surgical Research *Seryl and Charles Kushner Family Foundation* $100,000

MULTIPLE INVESTIGATORS UNDER THE DIRECTION OF H. LEON PACHTER NYU Institute for Surgical Research *Stephen C. Moss* $100,000

MULTIPLE INVESTIGATORS Alzheimer's disease research *William and Sylvia Silberstein Foundation, Inc.* $100,000

EVGENY A. NUDLER Increasing plants' resistance to adverse environmental conditions by manipulating the RNA thermosensor (HRS1) *Monsanto Company* $203,400

EVGENY A. NUDLER Research in anti-aging *Timur Artemyev* $1,000,000

VICTOR NUSSENZWEIG Development of human malaria vaccine delivered directly to dentritic cells *The Dana Foundation, Inc.* $300,000

IMAN OSMAN Development of a novel targeted therapy, MAB HU177 in melanoma *The Chemotherapy Foundation* $100,000

H. LEON PACHTER NYU Institute for Surgical Research *Renee and Philip Pilevsky* $100,000

MICHELE PAGANO The role of FBX031 in Breast Cancer *American Cancer Society* $138,000

MICHELE PAGANO The role of SCF ubiquitin ligases in multiple myeloma *Multiple Myeloma Research Foundation* $200,000

JEROME PETIT-JACQUES Generation and detection of motion detection in the mammalian retina *Whitehall Foundation, Inc.* $225,000

DAVID POLSKY Melanoma research program in The Ronald O. Perelman Dept. of Dermatology *Kenneth Gilman* $150,000

BARRY REISBERG Neurogenesis enhancers in the prevention and treatment of Alzheimer's disease *The Litwin Foundation* $1,513,920

DANIEL B. RIFKIN Inflammation and tumorigenesis in mice with TGF-B mutations *Philip Morris Companies, Inc.* $200,000

ANA RODRIGUEZ The role of hypoxanthine degradation in malaria-induced pathogenesis *Burroughs Wellcome Fund* $449,950

MARTIN SADOWSKI Peptide-mimetic therapeutic agents for blocking the apoE/Abeta interaction *American Federation for Aging Research* $240,000

JAMES L. SALZER Collaborative MS Research Center Award *National Multiple Sclerosis Society* $825,000

HERBERT SAMUELS Basic and translational research in breast cancer *Entertainment Industry Foundation* $105,000

HARALD SAUTHOFF Adenoviral delivery of transducible p53 for cancer treatment *Alliance for Cancer Gene Therapy* $500,000

NIRAV R. SHAH Outpatient cardiovascular guidelines applied in practice study *Robert Wood Johnson Foundation* $300,000

EINAR M. SIGURDSSON Clearance of pathological tau conformers *Alzheimer's Drug Discovery Foundation* $125,000

SUMATHI SIVAPALASINGAM NYU/Bomu training program in Kenya *Gilead Foundation* $208,190

JANE SKOK Epigenetic factors that contribute to the development of B-ALL *Elsa U. Pardee Foundation* $187,500

JULIA A. SMITH Integrated breast cancer care for medically underserved multiethnic women in New York *New York Community Trust/Orland S. and Frances Greene Fund; William and Francoise Barstow Foundation No. 1; and Jacqueline and Albert Smith Fund* $182,270

PAOLO G. TONIOLO Characterization and validation of genomic expression signature of pregnancy *Avon Foundation* $1,220,000

EDUARDO S. TROMBETTA Regulation of cellular immune responses to protein antigens *American Cancer Society, Inc.* $720,000

YOUSSEF ZAIN WADGHIRI Improving delivery and labeling efficiency of MRI probes in Alzheimer's disease *American Health Assistance Foundation* $150,000

ELAINE LYNETTE WILSON Molecular characterization of prostatic stem cells and their specific niche *Amgen* $1,184,310

ISAAC I. WIRGIN Stock structure of winter flounder using two complementary nuclear DNA approaches *New York Sea Grant* $218,000

DAVID ZAGZAG Human brain tumor bank research *Making Headway Foundation* $131,950

A special thank you to *Fiona and Stanley Druckenmiller, Helen L. Kimmel*, *Leonard Litwin*, *The Skirball Foundation*, *Joan and Joel Smilow, and Marica Vilcek and Jan Vilcek, MD, PhD,* for their ongoing philanthropic investments in research at NYU Langone Medical Center.

Credits (Images and Photographs)

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JEREMY S. DASEN, PHD

Assistant professor of physiology and neuroscience (Early Career Scientist, HHMI)

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