

DEFINING CREATIVITY



Icahn
School of
Medicine at
**Mount
Sinai**

DEFINING CREATIVITY

- 2** Letter from the Dean of the Icahn School of Medicine at Mount Sinai
- 5** Mount Sinai Health System
- 6** Innovation in Medical Education
- 12** Innovation in Graduate Education
- 18** Innovation in Health Care Delivery and Reform
- 24** Environment for Innovation
- 30** Leadership

MISSION

The mission of the Mount Sinai Health System is to provide compassionate patient care with seamless coordination and to advance medicine through unrivaled education, research, and outreach in the many diverse communities we serve.

VISION

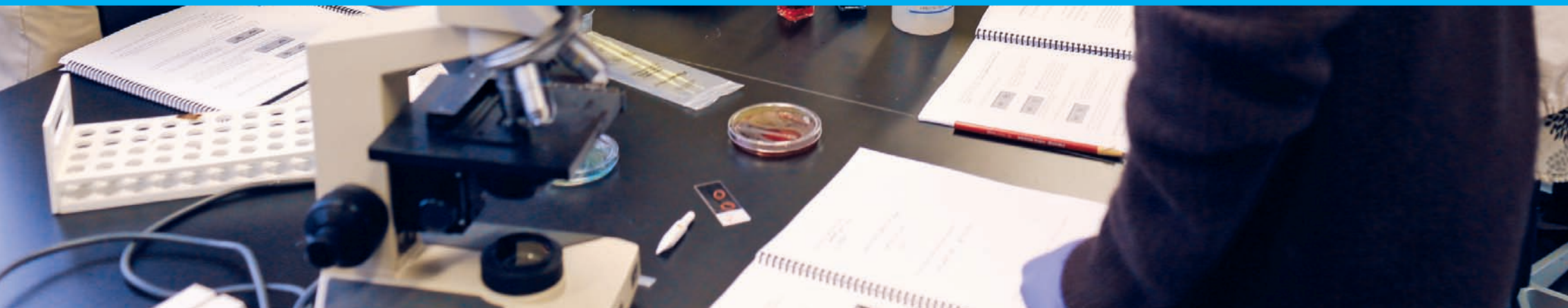
The Mount Sinai Health System's vision is to continue to grow and challenge convention through our pioneering spirit, scientific advancements, forward-thinking leadership, and collaborative approach to providing exceptional patient care in the many unique communities we serve.

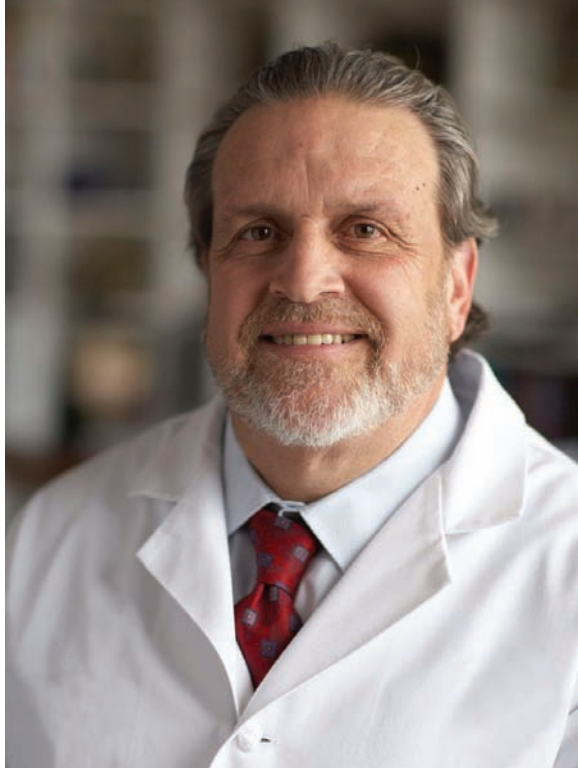
VALUES

Passionate
Creative
Empathic
Collaborative
Agile



A LOOK AT THE FUTURE FROM 2013





Letter from the Dean of the Icahn School of Medicine at Mount Sinai

The Icahn School of Medicine at Mount Sinai is at a transformative moment in its history. Over the past few years, we have pursued an ambitious path to teach, incentivize, and facilitate innovation across the health care spectrum. Now, with the unveiling of the Mount Sinai Health System in September (page 5), our clinical, research, and educational programs have been placed on a trajectory of unparalleled growth.

From revolutionizing medical school admissions and education (page 6) to inventing new models in health care delivery (page 18), we are working to change the way medicine is practiced. We are also committed to generating game-changing science in our labs, and to that end, we created the Center for Technology, Innovation, and Entrepreneurship (page 28) and launched a landmark institutional partnership with Rensselaer Polytechnic Institute (page 16). We also restructured and expanded our framework for therapeutic discovery (page 24) in order to create what the author Jon Gertner calls the “free environment for the operation of genius” (*The Idea Factory*).

At Mount Sinai, we embrace the view that breakthrough ideas and inventions do not happen in one “eureka” moment. Rather, they arise from a series of sudden insights and “no, not that—let’s try this” revelations. Creativity relies on the right people, in the right place, at the right time, and Mount Sinai is committed to bringing those people together. Whether on campus or in virtual communities that span the globe, our goal is to dismantle silos and foster the easy exchange of information that allows creativity to strike at a moment’s notice.

In these pages, I am proud to share with you the many fine and innovative programs we have developed in medical and graduate education, health care reform, and the spirit of innovation. From our founding in 1968 as one of the first stand-alone, hospital-based medical schools, doing things differently has been what Mount Sinai does best. And it is what we will continue to do.

Dennis S. Charney, MD

Anne and Joel Ehrenkranz Dean, Icahn School of Medicine at Mount Sinai and President for Academic Affairs, Mount Sinai Health System

It Takes a Health System

The Mount Sinai Health System represents the future of medicine in America. With seven member hospital campuses and an enormous network of ambulatory care centers throughout the New York metropolitan region, our newly expanded clinical enterprise was designed to increase and streamline access to primary care, as well as the full spectrum of specialty and subspecialty services, so we can best serve the entire New York metropolitan region and beyond.

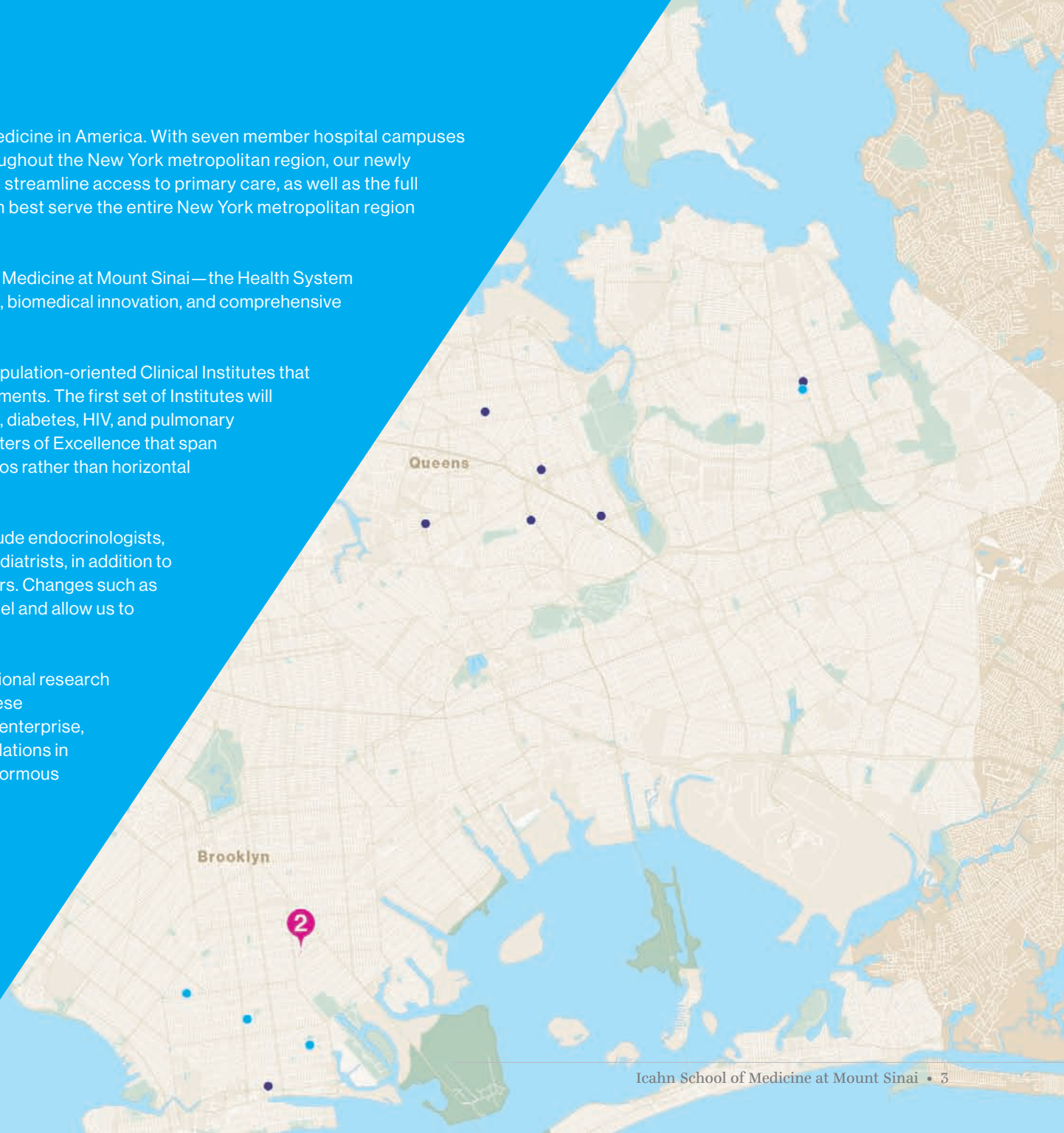
With a single medical school affiliation—the Icahn School of Medicine at Mount Sinai—the Health System also gives us unparalleled opportunities for clinical research, biomedical innovation, and comprehensive training programs.

To harness this strength, we are developing disease- and population-oriented Clinical Institutes that will work in concert with the more traditional medical departments. The first set of Institutes will focus on primary care, cancer, heart disease, brain diseases, diabetes, HIV, and pulmonary diseases. Within and across these entities, we will grow Centers of Excellence that span multiple departments that have operated more as vertical silos rather than horizontal collaborators.

The Center of Excellence for Diabetes, for example, will include endocrinologists, cardiologists, vascular specialists, ophthalmologists, and podiatrists, in addition to diabetic educators and clinical navigators and case managers. Changes such as this will place our patients at the very center of our care model and allow us to deliver more fully integrated and user-friendly services.

The Clinical Institutes are also designed to facilitate bidirectional research with our 15 robust Research Institutes (pages 16 and 31). These well-established Institutes are hubs of scientific and clinical enterprise, drawing on one of the largest and most diverse patient populations in the nation. In the new Health System, our clinical data are enormous in size and scope, and by sharing insights, researchers in the Clinical and Research institutes will be able to identify priority areas, fine-tune population studies, conduct large-scale genetic investigations, enhance clinical trial design, and greatly expand research derived from our biobank, BioMe™ (page 23).

Strategic growth has served Mount Sinai well since its inception. The size of the Health System gives us unparalleled opportunities to improve care and outcomes, invent better systems, and lower the per-capita cost of health care.





Mount Sinai Health System at a Glance

ONE LEADING MEDICAL SCHOOL

▲ Icahn School of Medicine at Mount Sinai

As one of the nation's top medical schools, Icahn School of Medicine at Mount Sinai is accelerating the pace of discovery through the integration of cutting-edge research and clinical medicine across the Mount Sinai Health System.

**One Gustave L. Levy Place
New York, NY 10029**

ol.
From
and edu
health car
change the v
committed to g
our labs, and to
Technology, Innov
28) and launched a
with Rensselaer Polyte
also restructured and ex
therapeutic discovery (pag
the author Jon Gertner calls
the operation of genius" (*The*

SEVEN MEMBER HOSPITAL CAMPUSES

1 Beth Israel Medical Center

Having remained true to its 100-year-old mission, this 856-bed hospital provides compassionate, high-quality care to patients across a broad range of specialties.

**First Avenue at 16th Street
New York, NY 10003**

2 Beth Israel Brooklyn

This 212-bed community hospital has many redesigned facilities and provides high-quality primary and specialty care.

**3201 Kings Highway
Brooklyn, NY 11234**

3 The Mount Sinai Hospital

Founded in 1852, this 1,171-bed facility is one of the nation's oldest and most respected tertiary- and quaternary-care teaching hospitals.

**One Gustave L. Levy Place
New York, NY 10029**

4 Mount Sinai Queens

This 235-bed hospital serves residents of western Queens with high-quality outpatient, inpatient, and emergency services.

**25-10 30th Avenue
Long Island City, NY 11102**

5 New York Eye and Ear Infirmary

Founded in 1820 as the nation's first specialty hospital, this 69-bed facility is a leader in the care of all diseases of the eyes, ears, nose, and throat.

**310 East 14th Street
New York, NY 10003**

6 Roosevelt Hospital St. Luke's-Roosevelt Hospital Center

Founded in 1871, this 505-bed community and tertiary-care hospital has renowned clinical programs and strong partnerships with federally qualified health centers.

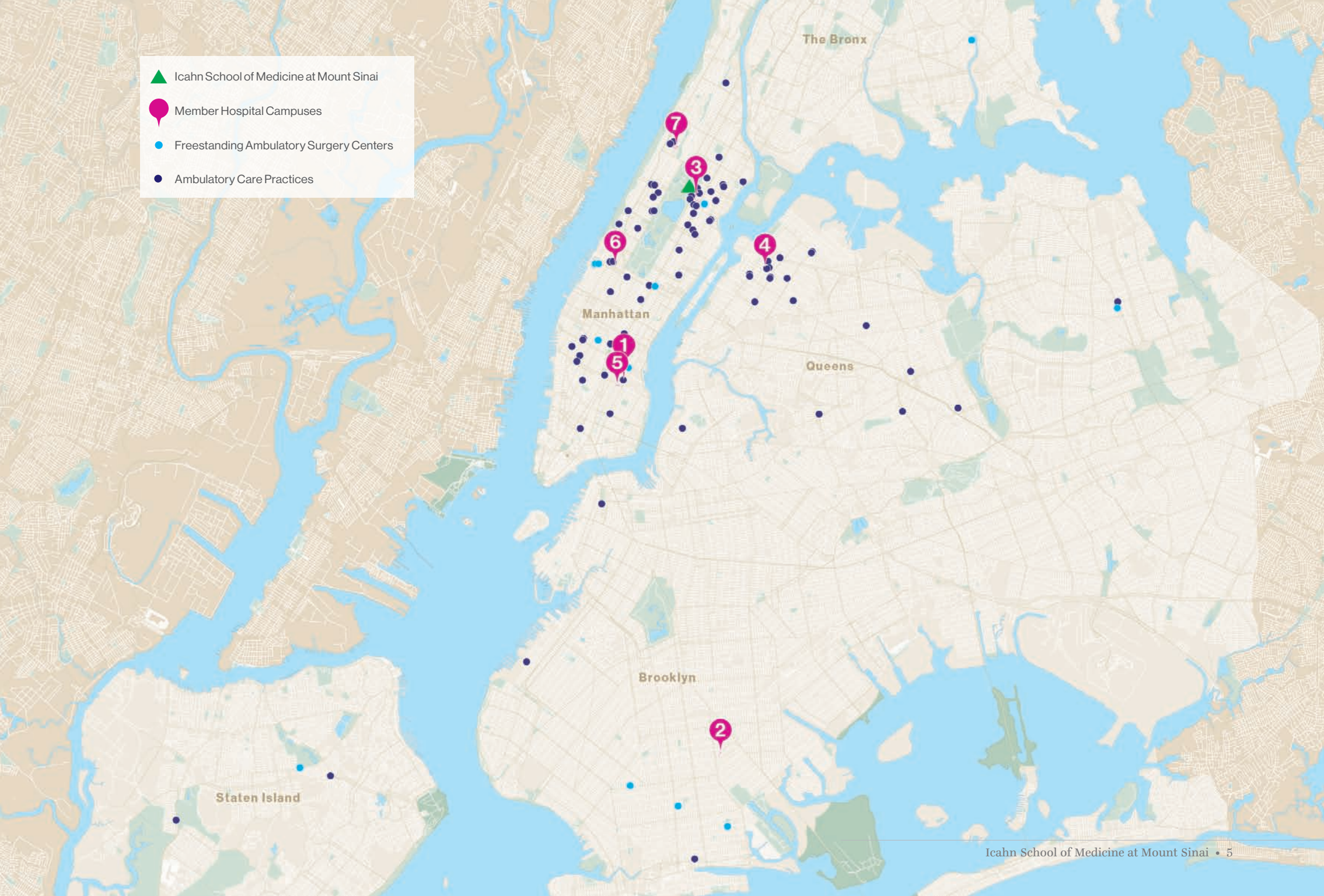
**1000 Tenth Avenue
New York, NY 10019**

7 St. Luke's Hospital St. Luke's-Roosevelt Hospital Center

Since its founding in 1847, this 523-bed hospital has been the principal health care provider for the communities of West Harlem and Morningside Heights.

**1111 Amsterdam Avenue
New York, NY 10025**

- ▲ Icahn School of Medicine at Mount Sinai
- Member Hospital Campuses
- Freestanding Ambulatory Surgery Centers
- Ambulatory Care Practices





“

Taking a new idea from concept to design to implementation should be fun and exciting. Ideas that don't make it are simply another way of learning really important lessons about progress.

”

Letter from the Dean for Medical Education

Creativity and innovation thrive in an environment where new ideas are welcome and conventional wisdom can be challenged. Those two attributes—creativity and innovation—are at the heart of everything we do at Icahn School of Medicine at Mount Sinai: clinical care, research, training and education, and advocacy for the underserved. We pride ourselves on our ability to push the envelope and think outside the box.

But innovation and creativity are not ends in themselves. Our ultimate goal is progress: creating changes that improve the world in which we live. We provide our students with the resources that allow them to achieve their maximum potential by advancing clinical care and science and promoting positive social change. As you will see in the programs illustrated in these pages, every aspect of our approach to medical education reflects our core values.

Medicine and biomedical science are rapidly evolving fields, but little has changed in terms of how we prepare students. In response, Icahn School of Medicine at Mount Sinai has redefined medical school admissions, offering early acceptance and exemption from the traditional requirements for up to half of each entering class (*FlexMed*).

We have a long history of taking a progressive approach to medical education. Unlike in the traditional model, our students are introduced to clinical experience on their first day of medical school (ASM/LCE), are offered advanced longitudinal clinical training in their third year (InterACT), and have the opportunity to incorporate the arts and humanities into their education (Academy for Medicine and the Humanities).

Our innovative approach is also notably reflected in the new curriculum launched this fall that features protected time for self-directed learning (Flex Time) and dedicated weeks to focus on topics critical to medical practice and biomedical research (InFocus).

We believe that risk-taking should be applauded and rewarded. Failure should not be feared, but rather embraced as an important lesson that will ultimately lead to progress. Most of our standout programs were once considered risks, but today they are emulated throughout the country. And we believe our newest programs will quickly follow suit.

David Muller, MD

*Marietta and Charles C. Morehand Chair, Medical Education
Dean for Medical Education
Professor and Chair, Department of Medical Education*



INNOVATION *in Medical Education*



Letter from the Dean for Medicine

Creativity and innovation thrive in an environment where new ideas are welcome and conventional wisdom can be challenged. Those two attributes—creativity and innovation—are at the heart of everything we do at the Icahn School of Medicine at Mount Sinai: clinical research, training and education, and advocacy for the underserved. We pride ourselves on our ability to stretch the envelope and think outside the box.

But innovation and creativity are not limited to themselves. Our ultimate goal is to create the changes that improve the world in which we live. We provide our students with the resources and support to help them to achieve their maximum potential in the fields of clinical care and science and to lead the way in positive change. As you will see in the pages of this letter, on these pages, every aspect of our curriculum and education reflects our commitment to innovation and creativity.

Medicine and biology are not the only fields, but little is known about these students. In the past, Mount Sinai has been offering a traditional classroom

“

Taking a new idea from concept to design to implementation should be fun and exciting. Ideas that don't make it are simply another way of learning really important lessons about progress.

”

“

Innovation always begins with a really good idea, but to translate that idea into reality, it is absolutely essential to have a team of superb colleagues from multiple backgrounds who work together harmoniously and very hard, take joy in their work, communicate constantly, and play together when the work is done.

”

PHILIP J. LANDRIGAN, MD, MSC, Dean for Global Health, the Ethel H. Wise Professor of Community Medicine, and Professor of Pediatrics, is a leader in the fields of environmental and global health.

“

We support novel endeavors, cheer on success, and boost students when a risky idea does not succeed. We try to role-model creativity through confidence, hard work, collaboration, and inspiration.

”

VALERIE PARKAS, MD, Associate Dean of Admissions and Associate Professor of Medicine and Infectious Diseases, has received numerous awards for her commitment to excellence in teaching.



Icahn School of Medicine at Mount Sinai Curriculum

YEAR 1



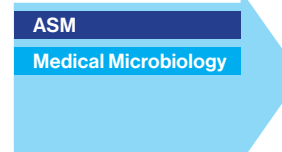
- Research Skills
- Global Health
- Service Learning
- Health Policy

WINTER BREAK



- Research Skills
- Global Health
- Service Learning
- Health Policy

SPRING BREAK



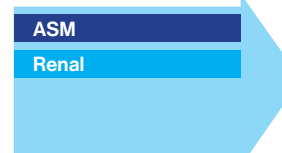
YEAR 2



- Research Skills
- Evidence-based Medicine
- Advocacy and Human Rights
- Career Planning



- Research Skills
- Evidence-based Medicine
- Advocacy and Human Rights
- Career Planning



YEAR 3



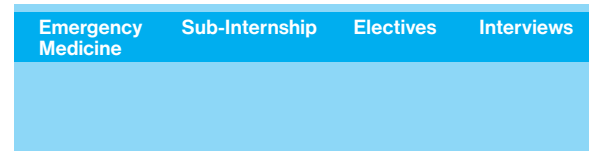
- Frontiers in Science
- Patient Safety and Quality
- Career Planning

- Frontiers in Science
- Patient Safety and Quality
- Career Planning
- Reflection



- Frontiers in Science
- Patient Safety and Quality
- Career Planning
- Reflection

YEAR 4



- Innovation
- Leadership in Health Care
- Teaching Skills
- Economics and Law of Medicine

Art and Science of Medicine (ASM)

This two-year experience provides medical students with the core knowledge, clinical skills, and professional attitudes essential for clinical practice, through early patient contact in ambulatory and inpatient settings.

A central patient-care experience in ASM is the **Longitudinal Clinical Experience (LCE)**, which, since 2004, has partnered day-one medical students with physician mentors and chronically ill patients. A long-term relationship continues into the beginning of the students' third year.

InFocus

InFocus weeks across all four years provide core curricula in topics critical to medical practice and biomedical research in the twenty-first century. These in-depth immersion experiences bring together outstanding interdisciplinary faculty and emphasize skill development and knowledge application. During these weeks, students do not have other class obligations.

Years 3 and 4

The schedule for Years 3 and 4 is comprised of four 12-week modules offering exposure to ambulatory care across the lifespan, anesthesiology, internal medicine, neurology, obstetrics and gynecology, pediatrics, psychiatry, and surgery. Select students also participate in a longitudinal integrated clerkship grounded in the foundations of ambulatory medicine and chronic illness care.

In response to major changes in the priorities of biomedical science and health care, Mount Sinai developed an early acceptance program

FlexMed

that was designed to drive a fundamental shift in pre-medical education. **FlexMed is the first program of its kind in the nation**, offering college sophomores from any major early acceptance, no MCAT requirement, and a progressive approach to medical school preparation for half of each entering class. The program is an expansion of Mount Sinai's longstanding Humanities and Medicine Early Assurance Program (HuMed) and the Science and Medicine Program (SciMed).

BEGINNING THIS YEAR WITH THE NEW CURRICULUM,

students are required to produce an independent scholarly product by graduation. Students are provided clinical, translational, basic, or educational research opportunities and mentored by world-class faculty.

FLEX TIME gives students a protected half-day per week in Years 1 and 2 so they can pursue self-directed learning, discovery, and leadership development opportunities.

All courses include a **FRONTIERS IN SCIENCE** talk, which exposes students to thought leaders and real-world science.

INTERCLERKSHIP AMBULATORY CARE TRACK (*InterACT*)

Launched in 2010, the **Interclerkship Ambulatory Care Track (*InterACT*)** goes well beyond traditional core clerkships by providing a yearlong clinical experience focused on ambulatory medicine and chronic illness. This unique longitudinal clerkship creates strong student-patient bonds, nurtures an interest in chronic illness, and exposes students to socioeconomic and cultural influences on urban health care. Through these experiences, students develop a deeper appreciation of chronic illness, advocacy, and the plight of the medically disenfranchised.

THERE ARE 140 STUDENTS ENROLLED IN THE FIRST-YEAR CLASS, OUT OF 5,468 COMPLETED APPLICATIONS, **FROM 70 DIFFERENT UNDERGRADUATE SCHOOLS, INCLUDING** PENN, YALE, BROWN, HARVARD, COLUMBIA, PRINCETON, AND THE UNIVERSITY OF CALIFORNIA SYSTEM; **25 PERCENT OF OUR CURRENT STUDENTS ARE FROM NEW YORK STATE.**

LAUNCHED IN 2012, THE

ACADEMY FOR MEDICINE AND THE HUMANITIES

expands the Icahn School of Medicine's longstanding emphasis on listening and careful observation. Through course topics such as writing, art history, and music, students are able to cultivate deeper relationships with their patients and develop a better understanding of their stories and illnesses.



Mount Sinai Global Health

MOUNT SINAI GLOBAL HEALTH offers students individually mentored missions around the world.

Our five-year **MD/MPH GLOBAL HEALTH TRACK** offers a free MPH and extensive field experience.

THE ARNOLD GLOBAL HEALTH TEACHING FELLOWSHIP provides post-graduate physicians with teaching, research, and management opportunities worldwide.



“

With respect to creativity in the laboratory, I can provide resources and guidance that facilitate its expression; but to truly unleash creativity you need big questions, freedom, and minimal fear of failure.

”

Letter from the Dean of Basic Sciences and the Graduate School of Biomedical Sciences

Creativity and innovation are often viewed as intellectual endeavors that anchor each end of the discovery continuum: it begins with a novel idea and ends with a breakthrough product. At the Graduate School for Biomedical Sciences, we see creativity as the thread that runs through the continuum. It inspires the early idea, formulates the research question, and drives the development of a new therapy or tool.

With that in mind, we are strategically expanding on the traditional PhD education, which is to understand how biological systems work, and how they malfunction and fail. Basic science is known as the discovery phase, and it remains the critically important foundation for all of our work. Discovery lights a scientist's fire. A scientist observing a new discovery through the microscope is the only person in the world who is aware of the new insight at that moment. Discovery is incredibly exciting. However, twenty-first century scientists need to be equally excited by seeing how their discovery will relate to disease. To that end, PhDs in the Graduate School of Biomedical Sciences are being trained not only as agents

of discovery, but also of innovation. Throughout their education, they must ask, “How might my insight end up being translated to improve human health?”

Time was, basic scientists used to leave the development phase to the physicians and engineers. In a departure from that approach, we want our scientists to be prepared to take their discoveries and move them forward through a team approach. Therefore, we have brought medicine and engineering into the Graduate School experience. Our faculty includes engineers, computational biologists, and physicians from a broad range of specialties. From the outset of a scientist's training here, he or she is grounded in rigorous mathematical problem solving, technology development, bioengineering methodologies, clinical workflows, and even the economics of science.

Our students will experience the exhilaration of discovery, but they will also know what to do next to move their insights through to innovative solutions to disease.

John H. Morrison, PhD

Dean of Basic Sciences and the Graduate School of Biomedical Sciences

Professor, Department of Neuroscience

Willard T. C. Johnson Research Professor of Geriatrics and Adult Development (Neurobiology of Aging)

INNOVATION

in Graduate Education

ratory



“
With respect to creativity in the laboratory, I can provide resources and guidance that facilitate its expression; but to truly unleash creativity you need big questions, freedom, and minimal fear of failure.
”

“

Switch fields before you become invested in a discipline's dogma. Balance the generation of hypotheses with open-ended exploration. Find creative young people, challenge them with large problems, empower them with the best tools, and then periodically check on their progress.

”

th

With the traditional biological approach, it remains the only person in the insight at that moment. However, twenty-first century Biomedical Sciences are being

ROSS L. CAGAN, PHD, Professor of Developmental and Regenerative Biology, and Associate Dean of the Graduate School of Biomedical Sciences, uses fly genetics to study human disease.

“

My formula for innovation is to try to ask new questions that are pertinent to a cancer problem. I try to find problems that affect a lot of people, since a solution here could have the greatest impact.

”

RAMON E. PARSONS, MD, PHD, Ward-Coleman Chair in Cancer Research, is an acclaimed researcher in cancer genetics.

A microscopic image of neurons, likely from a mouse brain, showing a dense network of cells with bright green fluorescence. The neurons have a characteristic shape with a cell body and extending processes. The background is dark, making the green-stained neurons stand out.

“

Innovation requires having the right team: a combination of diverse expertise among individuals who work effectively together. Innovation involves applying cutting-edge technologies or experimental approaches in new ways to new problems, with the result being fundamentally novel insight into a biological process in health and disease.

”

ERIC J. NESTLER, MD, PHD, Director of the Friedman Brain Institute, the Nash Family Professor, Chair of Neuroscience, and Professor of Pharmacology and Systems Therapeutics, and Psychiatry, specializes in understanding the molecular basis for drug addiction and depression.

Social defeat—a mouse model of depression—induces CREB activation in the ventral segmental area, a key brain reward region. CREB is a protein that, when activated, binds to a particular DNA sequence to control the flow of genetic information to RNA and to protein, thereby mediating some of the stress-induced impairments in reward.

Photo credit: Vincent Vialou, PhD, taken in the Nestler Laboratory

Multidisciplinary Training Areas

CANCER BIOLOGY

Research in the biology of cancer with a curriculum that challenges trainees to consider how their work may be translated into improvements in the diagnosis and treatment of cancer.

DEVELOPMENTAL AND STEM-CELL BIOLOGY

Working with various model organisms and *in vitro* cell systems to gain technical and intellectual expertise in these areas of research and their application to problems of biomedical importance.

DESIGN TECHNOLOGY AND ENTREPRENEURSHIP

Synthesizing biology, engineering, design, economics, and other disciplines to advance technologies that detect and treat human disease.

GENETICS AND GENOMIC SCIENCES

Exploring and applying genome organization and evolution, mechanisms of gene regulation, informatics and genome analysis, gene discovery and characterization, the molecular pathology of genetic diseases, and gene therapy.

IMMUNOLOGY

Giving students the individual intellectual and technical skills required to become outstanding scientists in the field of immunology.

MICROBIOLOGY

Training in areas such as antivirals, autoimmune disease, gene therapy, immunology, molecular virology, oncogenesis (cellular/viral), nucleic acid technology, signal transduction, and vaccine development.

NEUROSCIENCE

Exploring individual neurons and the molecules they synthesize, circuits connecting groups of neurons and regions of the nervous system, and the function of the nervous system in the organism as a whole.

SYSTEMS BIOLOGY OF DISEASE AND THERAPEUTICS

Integrated approaches to a systems-level of understanding the physiology and pathophysiology of human diseases and how key molecules and pathways can be targeted for therapeutic purposes.

STRUCTURAL/CHEMICAL BIOLOGY AND MOLECULAR DESIGN

Investigating structural and chemical biology with an eye toward the discovery and design of new compounds with the capacity to modulate the function of selected biological systems (e.g., the output of a signaling pathway or the cell-fate decision between survival and death).

A UNIQUE ACADEMIC AFFILIATION WITH **RENSELAER POLYTECHNIC INSTITUTE** in Troy, New York, pools Mount Sinai's expertise in biomedical research and patient care with Rensselaer's talent in engineering, computation, and prototyping. Through joint educational programs, research projects, and infrastructure, a new breed of translationally focused scientists will be trained.



From left: Shirley Ann Jackson, PhD, President, Rensselaer Polytechnic Institute, and Dennis S. Charney, MD, Anne and Joel Ehrenkranz Dean, Icahn School of Medicine at Mount Sinai, and President for Academic Affairs, Mount Sinai Health System

The Research Institutes

THE BLACK FAMILY STEM CELL INSTITUTE

THE CHARLES BRONFMAN INSTITUTE FOR PERSONALIZED MEDICINE

DIABETES, OBESITY, AND METABOLISM INSTITUTE

EXPERIMENTAL THERAPEUTICS INSTITUTE

THE FRIEDMAN BRAIN INSTITUTE

GLOBAL HEALTH AND EMERGING PATHOGENS INSTITUTE

ICAHN INSTITUTE FOR GENOMICS AND MULTISCALE BIOLOGY

IMMUNOLOGY INSTITUTE

INSTITUTE FOR MEDICAL EDUCATION

INSTITUTE FOR TRANSLATIONAL EPIDEMIOLOGY

THE MINDICH CHILD HEALTH AND DEVELOPMENT INSTITUTE

MOUNT SINAI HEART INSTITUTE

RECANATI/MILLER TRANSPLANTATION INSTITUTE

THE TISCH CANCER INSTITUTE

TRANSLATIONAL AND MOLECULAR IMAGING INSTITUTE

No 5

AMONG MEDICAL SCHOOLS FOR NATIONAL INSTITUTES OF HEALTH (NIH) AND OTHER FUNDING SOURCES PER INVESTIGATOR IN 2012

4

THE NUMBER OF PEER-REVIEWED PAPERS THAT MOUNT SINAI GRADUATE SCHOOL STUDENTS PUBLISH FROM THEIR THESIS WORK

Design, Technology, and Entrepreneurship

A new PhD training area—**Design, Technology, and Entrepreneurship (DTE)**—is focused on the discovery, design, development, and delivery of technology-based solutions to critical biomedical problems. DTE students receive advanced, problem-based training in a combination of biological sciences, engineering, and social sciences relevant to technology development. Graduates will enter their chosen field, be it academic medicine, biotechnology, or government service, with the technical expertise and practical experience needed to drive novel science from original biologic insight all the way through the commercial development process.



Q.E.D. Project

The yearlong **Q.E.D. Project** gives students hands-on technology-development experience. Student teams learn to define a specific problem, invent a technology-based solution to the problem, and build a novel prototype solution for it.

Photo: Geoffrey W. Smith, JD, founding Director of the Center for Technology, Innovation, and Entrepreneurship, discusses ideas with students.

Library Redesign: Innovation Commons

The creation of a new **RESEARCH AND LEARNING COMMONS** is about to transform Mount Sinai's Levy Library. The renovations, which began recently, will include building a new Innovation Lab to support research into projects with commercial potential, classrooms, and improved space for individual and group study. Plans also call for a new mixed-media studio where original digital video and audio content can be developed to support distance education and academic research, and a Mac-based shared computing lab with updated printing and scanning capabilities.

\$214.2 MILLION

IN NIH FUNDING FOR FY2013



“

Creativity at Mount Sinai has many dimensions, including imagining how to evolve a complex health system to thrive in a rapidly changing health care environment. My formula for unleashing that creativity involves working with talented and dedicated people, and trusting them to do their jobs.

”

Letter from the CEO of Mount Sinai Care

It is no secret that national health care spending is out of control and that population outcomes do not justify the costs. It is well reported that medicine must move from the outdated fee-for-service model into one that is more proactive toward individual patients and whole populations. No longer can we be content for patients to come to us. We must reach out and find them ourselves and reject the notion that poor outcomes are due to patient noncompliance or social issues that are beyond our control.

Fundamentally realigning the health care system in such a way is a massive undertaking, and one that requires a sustained commitment to innovation. Innovation means survival. This means we need fresh approaches and new skill sets in health care. We need experts who can design supercomputers, analyze big data, and develop user interfaces that are logical for doctors and patients. In hospitals and clinical offices, we need social workers and outreach coordinators with excellent people skills and an innate interest in getting to know the communities around where they work.

Mount Sinai Care, our Accountable Care Organization (ACO), is the umbrella under which these and other efforts are organized. It is part of the Medicare Shared Savings program, but we view it as a learning laboratory for population management and health care delivery innovation systemwide. In practical terms, we have embedded care coordinators in the offices of primary care physicians. We have developed new technologies and outreach protocols to find patients who are not receiving care at optimal standards, and we have trained a cadre of community-based health care workers to find patients in their homes and help manage their care in a cost-effective way.

The institutional investment is enormous, and yet we see the ACO as a transitional vehicle. We fully anticipate that in three to five years, health care delivery at Mount Sinai will look very different than it does now. That is because we are developing the tools, experience, and vision we need to survive in today's ever-evolving health care landscape.

Mark Callahan, MD

*Chief Executive Officer, Mount Sinai Care
Chief Ambulatory Officer, Mount Sinai Health System
Associate Dean for Clinical Excellence, Senior Faculty of
Medicine, and Health Evidence and Policy*



INNOVATION
*in Health Care Delivery
and Reform*



Letter from the CEO of Mount Sinai

It is no secret that national health care spending is out of control and that population outcomes do not justify the costs. It is well reported that medicine must move from the outdated fee-for-service model into one that is more proactive toward individual patients and populations. No longer can we be content for problems to come to us. We must reach out and find them, and reject the notion that poor outcomes are a result of patient noncompliance or social issues that are out of our control.

Fundamentally realigning the health care system in a way is a massive undertaking, and it requires a sustained commitment to innovation and investment in survival. This means we need to invest in new skill sets in health care. We need to invest in supercomputers, analyzing large data sets, and user interfaces that are logical and intuitive for hospitals and clinical settings. We need to invest in outreach coordination and patient education. It is an innate interest around where

“

Creativity at Mount Sinai has many dimensions, including imagining how to evolve a complex health system to thrive in a rapidly changing health care environment. My formula for unleashing that creativity involves working with talented and dedicated people, and trusting them to do their jobs.

”

“

At Mount Sinai Heart, our creativity is fueled like a car driving rapidly to improve global heart health. Our engine is science; our gasoline is education. Together, with steadfast scientific research and patient education, we can put the brakes on the No. 1 killer—heart disease.

”

VALENTIN FUSTER, MD, PHD, is Director of Mount Sinai Heart Institute, the Zena and Michael A. Wiener Cardiovascular Institute, and the Marie-Josée and Henry R. Kravis Center for Cardiovascular Health. Dr. Fuster, who is also the Richard Gorlin, MD/Heart Research Foundation Professor, is a global leader in cardiovascular medicine and research.

“

A diversity of perspectives is key for innovation. Another formula for innovation is to completely change the parameters of the world in which we are trying to solve problems. In the past, biologists defined their universe largely based on what they were able to see with human eyes, microscopes, or petri dishes. But with genomics and informatics, we can now rapidly search for biological innovation along billions of dimensions.

”

JOEL DUDLEY, PHD, Director of Biomedical Informatics, studies methods of incorporating genomic sequencing data into clinical practice.



ACO

In July 2012, Mount Sinai became the first hospital in Manhattan to receive ACO (Accountable Care Organization) status from the Centers for Medicare and Medicaid Services.

Today, Mount Sinai Care provides over 21,000 Medicare beneficiaries with high-quality, team-based care, while curbing growth in Medicare expenditures through greater integration and coordination across prevention, treatment, and follow-up.



Focus on Families

Mount Sinai's new academic Department of Family Medicine and Community Health is training the next generation of family physicians while improving access. Investigators are also conducting health-services research to promote the use of precision medicine in the primary care setting and to inform the national policies surrounding primary care.

↓ 53%

EMERGENCY
DEPARTMENT VISITS

↓ 44%

HOSPITAL
READMISSIONS

Emergency Department visits and readmissions have dropped sharply among Medicare patients enrolled in **Preventable Admissions Care Team (PACT)**.

Specially trained PACT coordinators help patients make appointments, retrieve and understand medications, arrange transportation if needed, and place phone calls to remind patients to follow their protocols.

Geriatric Emergency Department

In 2012, Mount Sinai received a Health Care Innovator Award from the Centers for Medicare and Medicaid Services to open the first geriatric emergency department in New York City.

The facility features skid-proof floors and extra handrails to help prevent falls, curtains designed to block out noise, extra heating units to keep patients warm, special mattresses that help prevent bedsores, and lounge chairs that are easier for geriatric patients to get into and out of.

> \$120
million
INVESTMENT
IN EHRs

Mount Sinai has invested more than \$120 million in the Epic electronic health record (EHR) system. *U.S. News & World Report* placed Mount Sinai highest among hospitals in the New York metropolitan region on its 2012-13 "Most Connected Hospitals" list.

Stroke Center Designation

In June 2013, Mount Sinai became the first medical center in New York State to receive advanced certification as a Comprehensive Stroke Center from the Joint Commission.

Mount Sinai provides dedicated neuro-intensive care beds for complex stroke patients and neuro-critical care to patients 24 hours a day, seven days a week. The Center has advanced-imaging capabilities; coordinates post-hospital care for patients; offers specialized procedures; and participates in stroke research, among other requirements for certification.



Photo: Stanley Tuhim (right), MD, Professor and Clinical Vice Chair of Neurology, with Glenn Johnson, a stroke survivor outpatient who participates in the Surviving and Thriving After Stroke support group facilitated by Mount Sinai's Comprehensive Stroke Center team.

145

**MOUNT SINAI
PHYSICIANS NAMED TO
NEW YORK MAGAZINE'S
"BEST DOCTORS" LIST
IN 2013, UP FROM 129
THE PREVIOUS YEAR.**

Care Coordination

Fifteen full-time care coordinators who are embedded in Mount Sinai's primary care practices utilize tools such as disease registries and reports built into the EHR to identify gaps in care that are based on nationally recognized quality metrics supported by the National Quality Forum.

Care Coordinators work directly with patients and families to remove obstacles that prevent patients from adhering to their care plans. This includes working with transportation services, pharmacies, payors, community-based resources, home-care agencies, and specialists to ensure that patients and their families have necessary supports in place.

CLIPMERGE: A Revolutionary New EHR Tool

To bring precision medicine into the exam room, Mount Sinai developed a first-in-nation and potentially revolutionary data-management and analysis platform designed to guide clinical care—in real time—based on patients' genetic makeup. CLIPMERGE (for Clinical Implementation of Personalized Medicine through Electronic Health Records and Genomics) communicates with the EHR—right in the doctor's office—to give point-of-care therapeutic guidance based on a patient's genetic profile.

>6,000

HOUSE CALLS

Starting with just 23 patients in 1995, Mount Sinai's Visiting Doctors Program is now the largest physician home-visiting program in the United States. Physicians, medical students, and residents make more than 6,000 house calls to over 1,000 patients with complex and serious illnesses throughout Manhattan.

>25,000

PATIENTS

25,000-plus patients are receiving more precise, personalized care—in real time—based on their own DNA. Each has enrolled in BioMe™, Mount Sinai's robust biobank, which is among the largest such repositories in the United States. It is also unique in that each patient has broadly consented to DNA sequencing, contact from researchers, and longitudinal studies stemming from the electronic medical record.



In my experience, creativity emerges from a healthy assimilation of talented, curious people within a milieu that fosters collegiality and risk-taking. Wonderfully creative synergies arise when constructed upon a foundation of shared successes and failures.



Letter from the Dean for Therapeutic Discovery

Innovation is a central tenet of Mount Sinai's culture. It drives our education, our research, and our health care delivery. At this watershed moment in medicine, innovation will lead to the greatest understanding of human disease and the most effective diagnostics and treatments.

For more than a century, Mount Sinai has continuously anticipated the future and seamlessly adapted to the present, identifying Tay-Sachs, Churg-Brill's, and Crohn's diseases, among others. Today, the Mount Sinai Health System is more nimble than ever. Our investments in genomic research, digital information technology, experimental therapeutics, and Big Data are providing us with the foundation we need to compete and prosper in the twenty-first century.

We have reorganized our technology transfer efforts and spent the past year building capacity, improving our processes, and forging bold new industry collaborations that promise to revolutionize medicine. As a result, our licensing proceeds for 2012 reached almost \$76 million, and we filed 81 new patents. Increasingly, Mount Sinai's world-class researchers are being sought out by companies looking to commercialize their discoveries.


In November 2012, we held a unique, three-day conference, *SINAIInnovations*, which drew more than 600 attendees from the Mount Sinai community, the pharmaceutical and biotechnology industries, and academia. This year, our November conference will highlight the power of Team Science, a key ingredient in accelerating progress.

To understand our commitment to creativity, look no further than these pages, which lay out Mount Sinai's roadmap for the future. Here we outline medical and graduate school classes that encourage students to take risks, pursue self-directed learning, and work in teams. We support entrepreneurial faculty who pursue their passion and challenge tradition and dogma.

Mount Sinai continues to recruit top scientists and clinicians. Prior to opening the state-of-the-art Leon and Norma Hess Center for Science and Medicine in December 2012, we anticipated that it would take three to five years to recruit leading scientists to work there. Yet, in less than a year, our 550,000-square-foot facility is more than 50 percent full, housing renowned specialists in cancer, neuroscience, cardiology, pediatrics, genomics, and imaging.

Scott L. Friedman, MD

Irene and Dr. Arthur M. Fishberg Professor of Medicine



Environment for
INNOVATION



“
In my experience, creativity emerges from a healthy assimilation of talented, curious people within a milieu that fosters collegiality and risk-taking. Wonderfully creative synergies arise when constructed upon a foundation of shared successes and failures.

”

“

We spur creativity by giving our scientists three elements needed for investigative freedom: one, tools and resources; two, a multidisciplinary team of experts; and three, true ownership. Being surrounded by great minds in different fields, and being connected to your research, fosters idea generation. It's all about doing work that matters.

”

ROGER J. HAJJAR, MD, Director of The Leona M. and Harry B. Helmsley Charitable Trust Cardiovascular Research Center, has made groundbreaking discoveries in gene therapies for cardiovascular disease.

e
pr
Cro
Sinai
investm
technology
providing us
and prosper in

We have reorganized
spent the past year b
processes, and forging
that promise to revolution
licensing proceeds for 2012
and we filed 81 new patents.
Sinai's world-class researchers
companies looking to commercial

“

If Howard Stevenson of the Harvard Business School is right, that 'Entrepreneurship is the pursuit of opportunity without regard to resources currently controlled,' then I would argue that creativity is the pursuit of novel solutions without restriction to received wisdom, existing tools, or a single discipline.

”

GEOFFREY W. SMITH, JD, founding Director of the Center for Technology, Innovation, and Entrepreneurship (cTIE), and Professor in the Department of Health Evidence and Policy, has developed landmark educational programs that are focused on the discovery, design, development, and delivery of technology-based solutions to critical biomedical problems.



“

One of the missions of my research team is to maximize interactions with other laboratories at Mount Sinai. We have been able to do this easily in the Leon and Norma Hess Center for Science and Medicine, where there is open space that greatly facilitates scientific interactions.

”

MIRIAM MERAD, MD, PHD, Professor of Oncological Sciences and Medicine, studies the mechanisms that regulate innate myeloid cells, including dendritic cells and macrophages.

Next-Generation Sequencing

The Life Technologies Ion Torrent™ sequencing suite, including both Proton and PGM instruments, is the latest addition to Mount Sinai's state-of-the-art CLIA (Clinical Laboratory Improvement Amendments)-certified Genomics Core Facility. The technology is suitable for whole-genome sequencing, and is particularly optimized for low-input, targeted clinical panels and cost effective whole-exome sequencing with rapid turnaround time. Other applications include methylation analysis, gene expression, small-genome sequencing, *de novo* sequencing, and small-RNA sequencing. Soon, the Ion Proton will also be able to perform sample-to-variant analysis of a human genome in one day at up to 20X coverage.

The Genetics Core Facility also relies on two platforms from Illumina and Pacific BioSciences that allow Mount Sinai investigators to perform next-generation sequencing and carry out basic and translational genomics research to diagnose and cure human diseases.

64
MILLION HOURS
PER YEAR

Minerva, Mount Sinai's sophisticated supercomputer, is one of the nation's highest-performing computers in academic medicine. Named after the Roman goddess of wisdom and medicine, Minerva provides researchers with 64 million hours of computation annually, allowing them to simulate and analyze large, complex data sets and expand the boundaries of scholarly inquiry.

cTIE

The new Center for Technology, Innovation, and Entrepreneurship (cTIE) is organized around three critical areas: teaching students how to think about science through problem-solving, supporting faculty to develop new technologies by providing clear milestone-driven frameworks, and exploring the economics of biomedical innovation to better understand the choices we need to make in deploying our resources.

THE LEON AND NORMA HESS CENTER FOR SCIENCE AND MEDICINE

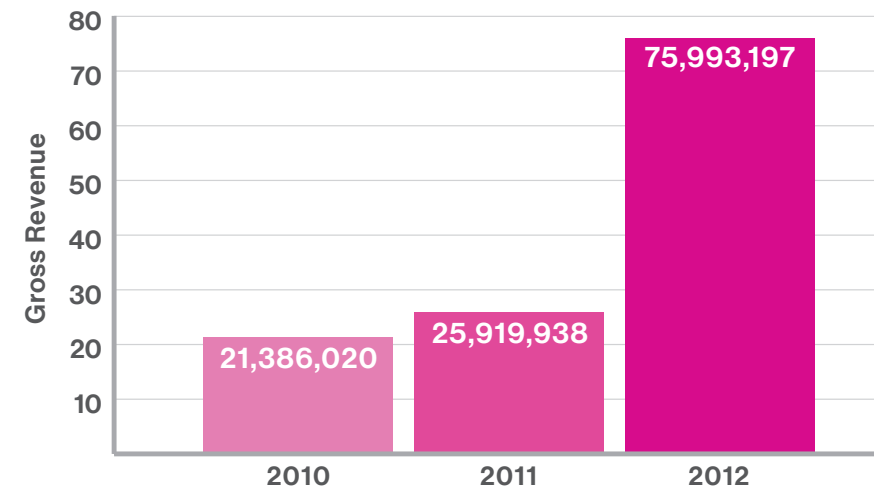
The Leon and Norma Hess Center for Science and Medicine, which opened at the end of 2012, provided Mount Sinai with nearly half-a-million square feet of outpatient clinical space, research laboratories, and state-of-the-art diagnostic imaging technology.

Mount Sinai physicians and scientists work in close proximity to one another in this sleek, light-filled building that was designed to accelerate the discovery of novel treatments for patients.

MOUNT SINAI'S INNOVATION PARTNERS

2010-2012 Financial Summary

LICENSING PROCEEDS (in dollars)



1.4 MILLION PEOPLE

in the United States are affected by inflammatory bowel conditions.

A new research alliance between Janssen Biotech Inc., a division of Johnson & Johnson, and the Icahn School of Medicine at Mount Sinai will use bioinformatics and data on large patient populations to identify biomarkers and other clinical attributes of inflammatory bowel disease (IBD). The alliance is expected to yield an understanding of IBD triggers and lead to therapeutic interventions and improved diagnostics.

48 INDUSTRY AGREEMENTS

In 2012, Mount Sinai entered into 48 industry-funded research and collaboration agreements, including:

- A multi-investigator collaboration with Exosome Diagnostics Inc., a biotech company in New York City, to develop next-generation diagnostics with Mount Sinai's Department of Pathology;
- A research project between Novo Nordisk and Mount Sinai's Department of Oncological Sciences and Department of Genetics and Genomic Sciences to develop a vaccine that halts beta-cell destruction in type 1 diabetes;
- A multiyear collaboration between Mount Sinai's Department of Microbiology and Roche to screen new antiviral drugs.

MOUNT SINAI'S INNOVATION PARTNERS
2012 Performance Metrics

325

FACULTY, STUDENTS, STAFF, AND TRAINEES ENGAGED WITH THE FOLLOWING:

38

LICENSES AND OPTIONS: THERE ARE CURRENTLY 125 LICENSES AND OPTIONS IN OUR ACTIVE PORTFOLIO.

49

COLLABORATIVE AND INDUSTRY-SPONSORED RESEARCH AGREEMENTS

\$76

MILLION

IN LICENSE PROCEEDS GENERATED BY 77 LICENSES/OPTIONS

\$6.8

MILLION

IN INDUSTRY RESEARCH FUNDING AND \$2 MILLION IN INDIRECT COSTS

6

EQUITY HOLDINGS IN SPINOUTS IN OUR ACTIVE PORTFOLIO

695

ENABLING AGREEMENTS: CDAs, MTAs, AND IIAs

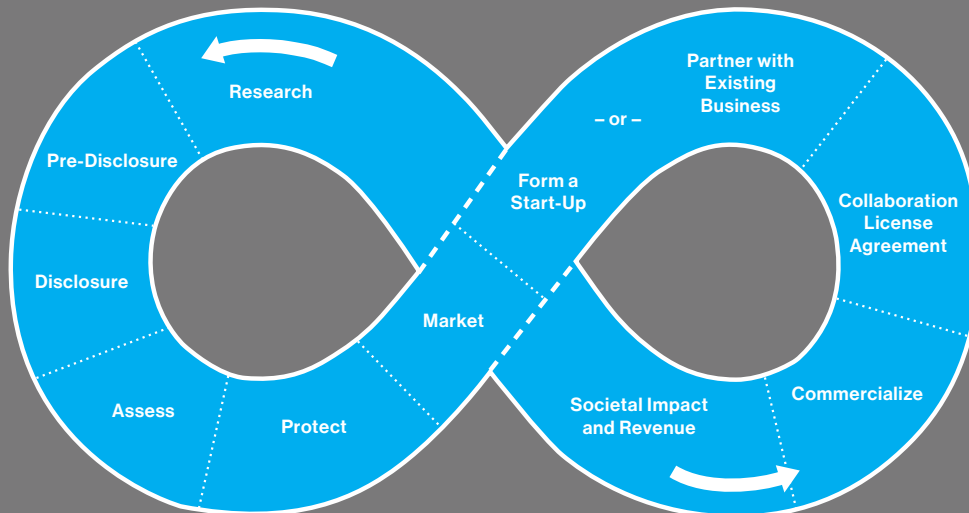
69

NEW TECHNOLOGY DISCLOSURES: THERE ARE CURRENTLY 456 DISCLOSURES IN OUR ACTIVE PORTFOLIO.

81

NEW PATENTS: THERE ARE CURRENTLY 1,400 PATENT CASES IN OUR ACTIVE PORTFOLIO.

Steps in the Commercialization Process



BOARDS OF TRUSTEES

Peter W. May, Chairman
Andrew M. Alper
Glenn R. August
Leon D. Black
Jeff T. Blau
Thomas R. Block
Andrew Borrok
Christopher W. Brody
Charles R. Bronfman
Henry M. Calderon
Gerald J. Cardinale
Peter A. Cohen
James W. Crystal
Jean C. Crystal
Edgar M. Cullman, Jr.
Susan R. Cullman
Bonnie M. Davis, MD
Glenn R. Dubin
Joel S. Ehrenkranz
Steven G. Einhorn
Blaine V. Fogg, Esq.
Richard A. Friedman
Robert Friedman
Sonia E. Gardner
Arne Glimcher
Donald J. Gogel
Clifford H. Goldsmith
David S. Gottesman

Judah Gribetz
Michael S. Gross*
Vicki Gross*
George J. Grumbach, Jr.
Carla A. Harris
Joshua J. Harris
Andrew D. Heineman
John B. Hess
Carl C. Icahn
Gail Golden Icahn
Lewis P. Jones
Ellen Katz
Michael Klein
Frederick A. Klingenstein
Henry R. Kravis
Jeffrey T. Laitman, PhD*
Eric S. Lane
Marc Lasry
Jo Carole Lauder
Andrew B. Leibowitz, MD*
Gila Leiter, MD*
John A. Levin
Patricia S. Levinson
Marc S. Lipschultz
Daniel S. Loeb
Howard Marks
Tony Martell
Kenneth B. Mehlman

Eric Mindich
Michael Minikes
Neil S. Mitchell
Joshua Nash
Robin Chemers Neustein
Bernard W. Nussbaum, Esq.
Peter R. Orszag
Joseph J. Plumeri
Jennifer Price*
Richard Ravitch
Judith O. Rubin
Robert E. Rubin
Eric M. Ruttenberg
Andrew M. Saul
Stephen L. Schwartz
Joseph C. Shenker, Esq.
Daniel H. Stern
Thomas W. Strauss
James S. Tisch
Michael J. Urfirer
Eric Waldman
Steven Weinfeld, MD*
Christopher J. Williams
David Windreich
John S. Winkleman
David M. Zaslav

*ex officio

LIFE TRUSTEES

William M. Ellinghaus
David A. Hamburg, MD
Carl M. Mueller
Frederic S. Nathan
Edie Schur
Alfred R. Stern

RESEARCH INSTITUTE DIRECTORS

IHOR R. LEMISCHKA, PHD
The Black Family Stem Cell Institute
Lillian and Henry M. Stratton
Professorial Chair

ERWIN P. BÖTTINGER, MD
The Charles Bronfman Institute
for Personalized Medicine
Irene and Dr. Arthur M. Fishberg
Professor of Medicine

ANDREW STEWART, MD
Diabetes, Obesity, and Metabolism
Institute
Irene and Dr. Arthur M. Fishberg
Professor of Medicine

PAUL J. KENNY, PHD
The Experimental Therapeutics Institute
Ward-Coleman Chair in Pharmacology
and Experimental Therapeutics

ERIC J. NESTLER, MD, PHD
The Friedman Brain Institute
Nash Family Professor

ADOLFO GARCÍA-SASTRE, PHD
Global Health and Emerging
Pathogens Institute
Irene and Dr. Arthur M. Fishberg
Professor of Medicine

ERIC E. SCHADT, PHD
Icahn Insititute for Genomics and
Multiscale Biology
Jean C. and James W. Crystal
Professor of Genomics

SERGIO A. LIRA, MD, PHD
Immunology Institute

REENA KARANI, MD
Institute for Medical Education

PAOLO BOFFETTA, MD
Institute for Translational Epidemiology

BRUCE D. GELB, MD
The Mindich Child Health and
Development Institute
Gogel Family Professor of the Mindich
Child Health and Development Institute

VALENTIN FUSTER, MD, PHD
Mount Sinai Heart Institute
Richard Gorlin, M.D./Heart Research
Foundation Professor

SANDER S. FLORMAN, MD
Recanati/Miller Transplantation Institute
Charles Miller, MD Professor of Surgery

STEVEN J. BURAKOFF, MD
The Tisch Cancer Institute
Lillian and Henry M. Stratton
Professor of Cancer Medicine

ZAHİ A. FAYAD, PHD
Translational and Molecular
Imaging Institute

DEPARTMENT CHAIRS

DAVID L. REICH, MD
Anesthesiology
Horace W. Goldsmith Professor of Anesthesiology

DAVID H. ADAMS, MD
Cardiothoracic Surgery
Marie-Josée and Henry R. Kravis Professor of Cardiothoracic Surgery

REGINALD W. MILLER, DVM
Comparative Medicine and Surgery

JOHN L. PFAIL, DDS
Dentistry

MARK G. LEBWOHL, MD
Dermatology
Sol and Clara Kest Professor of Dermatology

MAREK MLODZIK, PHD
Developmental and Regenerative Biology
Lillian and Henry M. Stratton Professorial Chair

ANDY S. JAGODA, MD
Emergency Medicine

NEIL CALMAN, MD
Family Medicine and Community Health

ERIC SCHADT, PHD
Genetics and Genomic Sciences
Jean C. and James W. Crystal Professor of Genomics

ALBERT L. SIU, MD
Geriatrics and Palliative Medicine
Ellen and Howard C. Katz Chair in Geriatrics and Adult Development

ANNETINE C. GELIJNS, PHD
Health Evidence and Policy
Edmond A. Guggenheim Professor of Health Policy

DAVID MULLER, MD
Medical Education
Marietta and Charles C. Morchand Chair in Medical Education

BARBARA MURPHY, MD
Medicine
Murray M. Rosenberg Professor of Medicine

PETER PALESE, PHD
Microbiology
Horace W. Goldsmith Professor of Medicine

STUART C. SEALFON, MD
Neurology
Sarah B. and Seth M. Glickenhau Professorship

ERIC J. NESTLER, MD, PHD
Neuroscience
Nash Family Professor

JOSHUA B. BEDERSON, MD
Neurosurgery

MICHAEL BRODMAN, MD
Obstetrics, Gynecology, and Reproductive Sciences
Ellen and Howard C. Katz Chairman's Chair in Obstetrics, Gynecology, and Reproductive Science

RAMON PARSONS, MD, PHD
Oncological Sciences
Ward-Coleman Chair in Cancer Research

DOUGLAS A. JABS, MD, MBA
Ophthalmology

EVAN L. FLATOW, MD
Orthopaedics
Bernard J. Lasker Professor of Orthopaedics

ERIC M. GENDEN, MD
Otolaryngology
Dr. Isidore Friesner Chair of Otolaryngology

CARLOS CORDON-CARDO, MD, PHD
Pathology
Irene Heinz Given and John LaPorte Given Professor of Pathology

LISA M. SATLIN, MD
Pediatrics
Herbert H. Lehman Professor of Pediatrics

PAUL J. KENNY, PHD
Pharmacology and Systems Therapeutics
Ward-Coleman Chair in Pharmacology and Experimental Therapeutics

PHILIP J. LANDRIGAN, MD, MSC
Preventive Medicine
Ethel H. Wise Professor of Community Medicine

WAYNE K. GOODMAN, MD
Psychiatry
Esther and Joseph Klingenstein Professor of Psychiatry

KENNETH ROSENZWEIG, MD
Radiation Oncology

BURTON P. DRAYER, MD
Radiology
Dr. Charles M. and Marilyn Newman Professor of Radiology

KRISTJAN T. RAGNARSSON, MD
Rehabilitation Medicine
Dr. Lucy G. Moses Professorship in Rehabilitation Medicine

MING-MING ZHOU, PHD
Structural and Chemical Biology
Dr. Harold and Golden Lamport Professorship in Physiology and Biophysics

MICHAEL L. MARIN, MD
Surgery
Dr. Julius H. Jacobson II Chair in Vascular Surgery

ASHUTOSH K. TEWARI, MD
Urology



Icahn
School of
Medicine at
**Mount
Sinai**

Icahn School of Medicine at Mount Sinai
One Gustave L. Levy Place, Box 1107
New York, NY 10029-6574