Dean’s Report
Graduate School of Biomedical Sciences

Top Mentors, Top Students, Top Science

It has been a time of outstanding achievement for Mount Sinai faculty, postdoctoral trainees, and graduate students. In 2017, our total National Institutes of Health funding increased to $318 million—up from $290 million in 2016. We are also ranked No. 2 in research dollars per investigator among private U.S. medical schools by the Association of American Medical Colleges.

Additionally, the Nature Index 2017 Innovation supplement ranked us among the top 10 research institutions in the world based on our contributions to published research that is later cited by other organizations in patent development (see story, page 4). And, in a first-of-its-kind spinoff, Sema4, which is a company owned by the Icahn School of Medicine at Mount Sinai with some 350 employees, began offering high-quality genetic testing to doctors and patients across the country—testing developed through our research enterprise.

At the core of this success is our faculty—extraordinary researchers and mentors who encourage our students and trainees to think boldly, without boundaries, and to take measured risks that spur innovation and advances. Faculty, postdoctoral trainees, and students have the best of both worlds here—we are a comparatively small community of scholars, but with access to the vast resources of the Mount Sinai Health System: seven hospital campuses, renowned centers of excellence and research institutes, 285-plus research laboratories, and unique academic partnerships that offer unparalleled opportunities for research and study.

Our top-notch PhD programs in biomedical sciences, neuroscience, and clinical research, along with expanded Master’s programs in biomedical science, public health, biostatistics, clinical research, genetic counseling, and health care delivery leadership, prepare the next generation of leaders and changemakers for a variety of career paths in academia, industry, and health care. Every day, we celebrate the passion and commitment of our faculty and students who continue to be the driving force of excellence that defines Mount Sinai’s Graduate School of Biomedical Sciences.

Leading Research and Training Programs in Microbiology

Ana Fernandez-Sesma, PhD, Professor of Microbiology, Icahn School of Medicine at Mount Sinai, and Co-Director of the Microbiology Multidisciplinary Training Area, is one of the nation’s top National Institutes of Health (NIH)-funded investigators in microbiology—ranked No. 5 nationally in a department that is ranked No. 4 in NIH funding. The Department includes luminaries Peter Palese, PhD, Chair of Microbiology, and a member of the National Academy of Medicine and National Academy of Sciences; and Adolfo García-Sastre, PhD, pioneers in the study of the molecular basis of influenza viruses, ranked No. 15 and No. 10 respectively, in NIH funding.

As principal investigator for one of the National Institutes of Health/National Institute of Allergy and Infectious Diseases (NIH/NIAID)-funded multicenter

continued on page 2

Ana Fernandez-Sesma, PhD, with MD/PhD student Rebecca Hamlin.
A groundbreaking study in mice showed that early-life stress during a sensitive period of postnatal development encodes a susceptibility to additional stress and depression-like behavior in adulthood. The study, published June 16, 2017, in Science, was led by postdoctoral fellow Catherine Peña, PhD, who worked closely with her mentor and the study’s senior author, Eric J. Nestler, MD, PhD, Nash Family Professor of Neuroscience, Director of The Friedman Brain Institute, and Dean for Academic and Scientific Affairs.

The research team found that mice, when stressed during this sensitive period, showed depressed levels of the transcription factor orthodenticle homeobox 2 (Otx2) in the ventral tegmental area (VTA), a brain reward region. While these Otx2 levels recovered by adulthood, their early suppression had already set in motion gene alterations in the VTA that lasted into adulthood. Furthermore, the researchers discovered that these early-stressed mice were more likely to succumb to depression-like behavior in adulthood after additional adult stress. Supporting the work was the first-time use of genome-wide transcriptome analysis by RNA-sequencing in research modeling early-life stress.

The study is a pointed example of opportunities that can emerge from well-structured mentor-mentee programs for graduate students and postdocs. Mount Sinai’s Department of Neuroscience is ranked No. 2 in the nation in National Institutes of Health (NIH) funding—Dr. Nestler is ranked No. 7 in individual funding.

“For graduate students and postdocs, our Graduate School offers an incredibly rich array of faculty expertise,” says Dr. Nestler, adding that Dr. Peña’s work benefited from the knowledge, reagents, and new perspectives from a wide range of labs at Mount Sinai. “The study took advantage of not only the strengths of my lab, but also the unique research strengths brought by Dr. Peña,” says Dr. Nestler. “By learning new technology and applying it to my research in a way that had never been done before, I was able to gain valuable insights,” adds Dr. Peña. “The result,” says Dr. Nestler, “was a very novel paper published in Science.”

Leading Research and Training Programs in Microbiology continued from page 1

Human Immunology Project Consortia, Dr. Fernandez-Sesma is leading a high-powered team of investigators to study human immune responses to dengue virus (DENV) infection and vaccination. That group includes Mount Sinai colleagues Dr. García-Sastre; Miriam Merad, MD, PhD; Adeeb Rahman, PhD; Andrew Kasarskis, PhD; and Jun Zhu, PhD; Eva Harris, PhD, UC Berkeley School of Public Health; Steven Wolinsky, MD, Northwestern University Feinberg School of Medicine; Nevan Krogan, PhD, University of California, San Francisco; Anna Durbin, MD, Johns Hopkins Bloomberg School of Public Health; Stephen Whitehead, PhD, NIH/NIH/NIAD; and Sumit Chanda, PhD, Sanford Burnham Prebys Medical Discovery Institute.

The Dengue Human Immunology Project Consortia (DHIPC) investigators are studying innate immune responses to DENV in infected individuals from a Nicaraguan pediatric cohort and DENV-vaccinated individuals, as well as validations in ex-vivo systems. The work has generated crucial data on early events in DENV infections that can shape the adaptive immunity directed against these viruses and help scientists to understand the complex immune responses that take place in DENV-infected or vaccinated individuals. The project also includes the study of human immune responses to chikungunya and Zika viruses.

Mount Sinai Researchers Advance Study of DENV Infection

Dr. Fernandez-Sesma’s lab broke additional ground by identifying host factors that initiate the human immune response to DENV infection, while describing how the virus counteracts this mechanism and evades immune detection—findings published this spring in Nature Microbiology.

Mount Sinai contributors to that article included: Research Assistant Professors (and former postdocs): S. Aguirre, PhD (first author), P. Luthra, PhD, and S. Tripathi, PhD; current postdoctoral fellows: M.T. Sanchez-Aparicio, PhD, and Solovyov A. Maestre, PhD; PhD students T. Zhu, L.G. Webb, and J. Patel; MS in Biomedical Science student A.C. Fredericks; and J. Pintado-Silva, a student in the Graduate School’s Post-Baccalaureate Research Education Program who is currently a PhD student.
The study is a pointed example of opportunities that can emerge by RNA-sequencing in research modeling early-life stress. Work was the first-time use of genome-wide transcriptome analysis alterations in the VTA that lasted into adulthood. While these Otx2 levels recovered by adulthood, in the ventral tegmental area (VTA), a brain reward transcription factor orthodenticle homeobox 2 (Otx2) and Dean for Academic and Scientific Affairs. Postdoctoral Fellow Catherine Peña, PhD, who worked stress and depression-like behavior in adulthood. The development encodes a susceptibility to additional life stress during a sensitive period of postnatal life. A groundbreaking study in mice showed that early-funding—Dr. Nestler is ranked No. 7 in individual funding. Mentor-Mentee Collaboration Leads to a Novel Study

The Dengue Human PhD, Sanford Burnham Prebys NIAID; and Sumit Chanda, MD, Johns Hopkins Bloomberg Public Health; Steven Wolinsky, MD, Eva Harris, PhD, UC Berkeley School of Kasarskis, PhD; and Jun Zhu, PhD; group includes Mount Sinai colleagues. DENV infection and vaccination. That powered team of investigators to study responses to chikungunya and Zika viruses. Dr. Fernandez-Sesma is leading a high-ex-vivo cohort and DENV-vaccinated individuals, individuals from a Nicaraguan pediatric group. "For graduate students and postdocs, our Graduate School offers reagents, and new perspectives from a wide range of labs at Mount Sinai. "The study took advantage of not only the strengths of my reagents, and new perspectives from a wide range of labs at Mount Sinai. Frazer Kasarskis, the BD2K-LINCS data coordination and integration center (DCIC), which is not only developing methods to better harness and manage big data in biomedicine at the national level, but also teaching students how to process, analyze, and visualize complex biomedical datasets to someday solve medicine’s greatest challenges. Big Data to Knowledge (BD2K) was launched in 2014 by the NIH to bridge the gap between the amount of big data that is collected and the data that can be used for knowledge discovery. Icahn School of Medicine was named as one of 12 national BD2K Centers of Excellence. The center also serves as the data coordination and integration center for the Library of Integrated Network-Based Cellular Signatures (LINCS) NIH Common Fund program. The center analyzes and integrates data from six LINCS data generation centers from around the country. By collecting big data from many types of human cells after treatment with many drugs and genetic stressors, LINCS aims to give scientists a better understanding of the pathways that control cell behavior. The data coordination and integration center is funded through a six-year, $20 million NIH grant. In 2016, Mount Sinai was ranked No. 3 nationally in NIH funding for Pharmacology; Dr. Ma’ayan was ranked No. 3 in individual NIH funding. The BD2K-LINCS DCIC run by Dr. Ma’ayan has also become a powerful platform for graduate level education in the fields of systems biology and genomics. The center hosts a Summer Research Training Program in Biomedical Big Data Science for graduate and undergraduate students, which attracts some of the country’s brightest young talent.

Technology for identifying at-risk atrial fibrillation patients developed by Ya-El Mandel-Portnoy, PhD, through her start-up company, Cardea Sciences, won the inaugural Alexandria LaunchLabs Scholarship Award at the 2017 NYC Life Science Innovation Showcase. Dr. Mandel-Portnoy created her technology during her doctoral program in Clinical Research at the Graduate School of Biomedical Sciences—under the mentorship of Lynne D. Richardson, MD, Professor and Vice Chair of Emergency Medicine, Professor of Population Health Science and Policy, and a member of the National Academy of Medicine—and launched her company by working with Mount Sinai Innovation Partners, the commercialization arm of the Icahn School of Medicine at Mount Sinai. The award includes laboratory and office space at the Alexandria LaunchLabs® NYC, a full-service life-science start-up platform. “Ya-El’s work is a perfect example of how validating new technology through clinical research is helping to improve medical care and patient outcomes,” says Janice Gabriolove, MD, The James F. Holland Professor of Medicine, and Director, Clinical Research Education Program.
### Top 10 World Ranking

The Icahn School of Medicine at Mount Sinai is among the top 10 research institutions in the world based on its contributions to published research that is later cited by other organizations in patent development. The rankings, created by the *Nature Index 2017 Innovation* supplement and published in August, used a unique set of metrics to shed light on the impact academic research is having on innovation and determine key academic players whose ideas may shape tomorrow’s inventions. According to the *Nature Index*, the top rankings reflect institutions with global reputations for high-quality research and others whose published work is having a disproportionately high impact relative to their size. The Scripps Research Institute in San Diego (No. 1), Rockefeller University in New York City (No. 2), and Massachusetts Institute of Technology (No. 3) led the list, which also included, among others, “U.S. research heavyweights — the National Institutes of Health (No. 7), University of California, San Francisco (No. 8), and Stanford University (No 9),” a press release issued by the publication wrote, adding, “Icahn School of Medicine at Mount Sinai is notably placed tenth.”

### By the Numbers

**Nature** Publication Names Mount Sinai Among Most Innovative in Research

The Icahn School of Medicine at Mount Sinai is among the top 10 research institutions in the world based on its contributions to published research that is later cited by other organizations in patent development. The rankings, created by the *Nature Index 2017 Innovation* supplement and published in August, used a unique set of metrics to shed light on the impact academic research is having on innovation and determine key academic players whose ideas may shape tomorrow’s inventions. According to the *Nature Index*, the top rankings reflect institutions with global reputations for high-quality research and others whose published work is having a disproportionately high impact relative to their size. The Scripps Research Institute in San Diego (No. 1), Rockefeller University in New York City (No. 2), and Massachusetts Institute of Technology (No. 3) led the list, which also included, among others, “U.S. research heavyweights — the National Institutes of Health (No. 7), University of California, San Francisco (No. 8), and Stanford University (No 9),” a press release issued by the publication wrote, adding, “Icahn School of Medicine at Mount Sinai is notably placed tenth.”

### Top 10 NIH-funded Basic Science Departments

<table>
<thead>
<tr>
<th>Department</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuroscience</td>
<td>No.2</td>
</tr>
<tr>
<td>Pharmacology</td>
<td>No.3</td>
</tr>
<tr>
<td>Genetics</td>
<td>No.4</td>
</tr>
<tr>
<td>Microbiology</td>
<td>No.4</td>
</tr>
</tbody>
</table>

### Research Laboratories

285+

### Scientific Research Priorities

- Molecular Brain
- HIV Development
- Drug Autism Signaling
- Cancer Function
- Virus Inflammation
- Mechanisms Treatment
- Disease

### Contact Us

- Twitter: @GradSchoolSinai
- Facebook: https://www.facebook.com/GradSchoolBiomedMountSinai
- icahn.mssm.edu/education/graduate