

Six new Rockefeller scientists bring fresh expertise to faculty ranks

From among hundreds of applicants, six new junior faculty members have joined Rockefeller since January 2017, launching laboratories devoted to tuberculosis, gene origination, memory, biomechanical forces, and genome architecture. Their arrival is a testament to the success of our open search process, which works to identify and recruit highly capable scientists conducting transformative research in the biosciences. The newest heads of laboratory are:

Gregory M. Alushin

ASSISTANT PROFESSOR LABORATORY OF STRUCTURAL BIOPHYSICS AND MECHANOBIOLOGY

Whether maneuvering about under their own power, or being pushed and pulled by the surrounding tissue, cells both produce and receive mechanical forces. Alushin, a biophysicist, investigates how cells use their structural filaments to sense and respond to such forces. He uses cryo-electron microscopy, among other techniques, to understand how these filaments respond at the molecular level, and how changes to their protein structure are linked to other processes, such as gene expression.

Priya Rajasethupathy

JONATHAN M. NELSON FAMILY ASSISTANT PROFESSOR LABORATORY OF NEURAL DYNAMICS AND COGNITION

For humans, the ability to form and recall memories is what gives meaning to existence. Rajasethupathy seeks to understand the mechanisms by which memories are recorded, stored, and retrieved—and therefore how computations in the brain give rise to behavior, cognition, and emotion. Her research shows that while individual memories seem stable, the assemblage of neurons and circuits that conjures them is in fact constantly evolving as memories are written and rewritten.

Viviana I. Risca

ASSISTANT PROFESSOR LABORATORY OF GENOME ARCHITECTURE AND DYNAMICS

Although we think of the genome as a list of letters that can be read left to right, DNA is in fact coiled and neatly packed into an intricate three-dimensional structure. This structure plays an active role in providing access to specific genes. Risca is interested in understanding the biophysical rules that govern the organization of DNA, and how the genome's architecture contributes to gene expression and, more broadly, to processes that determine cell fate or contribute to disease.





◀ Jeremy M. Rock

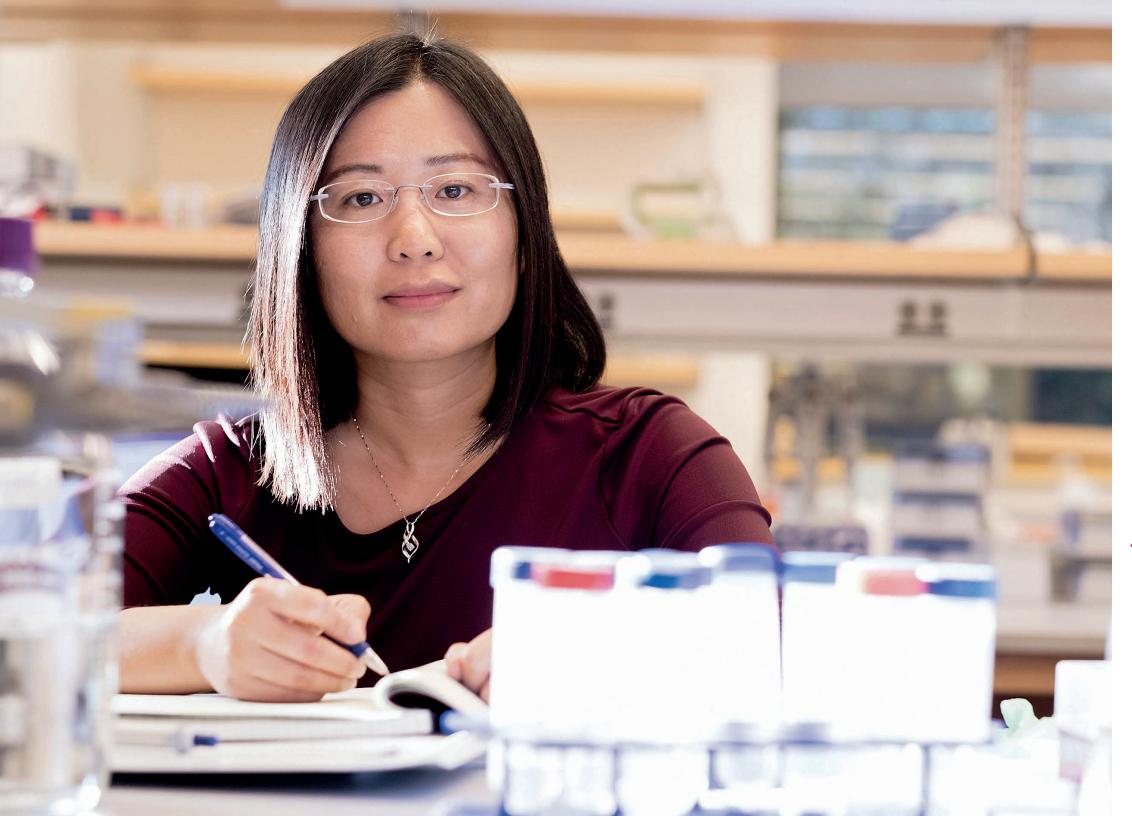
ASSISTANT PROFESSOR LABORATORY OF HOST-PATHOGEN BIOLOGY

Rock uses genetics to better understand the *M. tuberculosis* bacterium, which is responsible for one of the most enduring and deadly infectious diseases in history. Although *M. tuberculosis*'s slow reproductive cycle and highly infectious nature make it a particularly difficult microbe to study, Rock has adapted a gene-editing technology, CRISPR, to work in the bacterium, and is using it to identify genes that allow TB to remain dormant for long durations. Those genes, he says, could serve as targets for new therapies.

Amy E. Shyer

ASSISTANT PROFESSOR LABORATORY OF MORPHOGENESIS

A developmental biologist, Shyer is interested in embryonic organ formation, the process by which cells arrange themselves into particular patterns in order to form the tissue of a specific organ. But rather than looking merely at the genes that influence these processes, Shyer is investigating the physical dynamics of the cells of developing organisms—working in chicken embryos, she has found that mechanical interactions between cells are critical to the formation of tissue and the emergence of specific organ shapes.



◀ Li Zhao

ASSISTANT PROFESSOR LABORATORY OF EVOLUTIONARY GENETICS AND GENOMICS

New genes often emerge from existing genes. But sometimes they don't; sometimes genes appear to arise from scratch, from the noncoding DNA that makes up a significant part of our genome. Zhao studies the birth of these so-called de novo genes, asking questions about what causes such genes to appear, how they influence an organism's ability to adapt to its environment, and how they spread within populations.

A Nobel and a Lasker are among dozens of scientific honors bestowed on Rockefeller scientists

In the fall of 2017, Michael W. Young, the Richard and Jeanne Fisher Professor, became the 25th Rockefeller scientist to win a Nobel Prize for his investigations of the genetics that underlie circadian clocks. Timekeeping is a critical function necessary to many types of cells, and helps keep metabolic processes, hormone levels, and brain function on a daily schedule. Young's prize in Physiology or Medicine honors a body of work that Young began shortly after his arrival at Rockefeller in 1978.

Less than a year later, C. David Allis, the Joy and Jack Fishman Professor, was named a winner of the 2018 Albert Lasker Basic Medical Research Award, widely regarded as America's top prize in biomedical research. Allis is interested in the how histone proteins—which package DNA in a cell's nucleus—play a role in turning on or off individual genes, and his work has led to a broad understanding of the importance of epigenetic factors as causes of disease. Allis is the 23rd Rockefeller scientist to receive a Lasker.

C. David Allis

Albert Lasker Basic Medical Research Award March of Dimes Prize

Gregory M. Alushin

Presidential Early Career Award for Scientists and Engineers

Cori Bargmann

Election to the National Academy of Medicine

Kivanç Birsoy

NIH Director's New Innovator Award Pershing Square Sohn Prize

Jean-Laurent Casanova

AAI-Steinman Award for Human Immunology Research

Titia de Lange

Lewis S. Rosenstiel Award

Winrich Freiwald

Perl-UNC Neuroscience Prize

Jeffrey M. Friedman

Elected to Royal Society

Elaine Fuchs

McEwen Award for Innovation

Howard C. Hang

Eli Lilly Award in Biological Chemistry

Mary E. Hatten

Election to the National Academy of Sciences Ralph W. Gerard Prize in Neuroscience

A. James Hudspeth

Kavli Prize in Neuroscience

Shixin Liu

NIH Director's New Innovator Award

Gaby Maimon

HHMI investigator

Luciano Marraffini

Albany Medical Center Prize HHMI investigator NIH Director's Pioneer Award

Bruce S. McEwen

Fondation IPSEN Endocrine Regulations Prize

Daniel Mucida

NIH Director's Transformative Research Award

Michel C. Nussenzweig

Sanofi-Institut Pasteur Award

Priya Rajasethupathy

NIH Director's New Innovator Award

Jeffrey V. Ravetch

Robert Koch Award Ross Prize in Molecular Medicine

Jeremy M. Rock

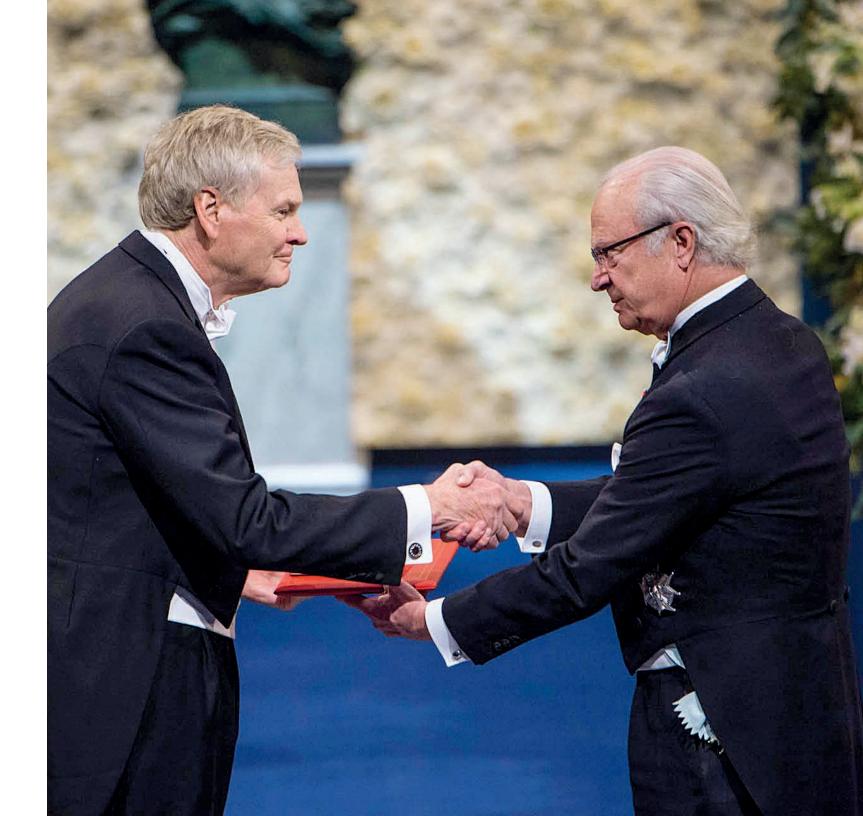
NIH Director's New Innovator Award

Gabriel D. Victora

MacArthur Fellowship
NIH Director's Pioneer Award

Michael W. Young

Nobel Prize





EDUCATION

Class of 2018 includes two student award winners

Thirty men and women received doctoral degrees in 2018, bringing the total number of Rockefeller degrees awarded to 1,262 since the founding of the graduate program in 1959. In addition, honorary degrees were awarded to two scientists and a long-serving Trustee.

The year's class was especially prolific, having authored or co-authored 76 publications including two in *Science*, five in *Nature*, and seven in *Cell*. Lillian B. Cohn, who worked to understand how latent HIV-infected cells persist in their hosts, was a 2018 recipient of the Harold M. Weintraub Graduate Student Award, widely considered the most prestigious national award for graduate students in the biosciences. Raphael Cohn, who developed a new way to visualize connections between individual neurons, was also a 2017 Weintraub Award recipient.

Honorary degrees were awarded to: Susan Solomon, an MIT environmental scientist and pioneer in research on humanity's role in climate change; Robert Tjian, a UC Berkeley biologist who has made important insights about the molecular mechanisms governing gene regulation; and Richard E. Salomon, vice chair of Rockefeller's Board of Trustees and one of its longest-serving members.

Number of graduates



A new riverside lab building, with a two-acre green roof

A dramatic new mid-air campus, the Stavros Niarchos Foundation—David Rockefeller River Campus, has gone from steel framework to sleek finished building. The new campus and its centerpiece, the Marie-Josée and Henry R. Kravis Research Building, expand the university's footprint by two acres over the FDR Drive. With 160,000 square feet and room for nearly 600 scientists, the addition is the most dramatic reimagining of the Rockefeller University campus in 65 years.

outdoor amphitheater

Huge landscaped roof with

The Hess Academic Center contains modern offices for the President and Dean

and university events

Kellen BioLink and Fascitelli Great Lawn, for scientific retreats

Two floors of laboratories, each as long as three NYC blocks

The all-glass Bass Dining

East River views

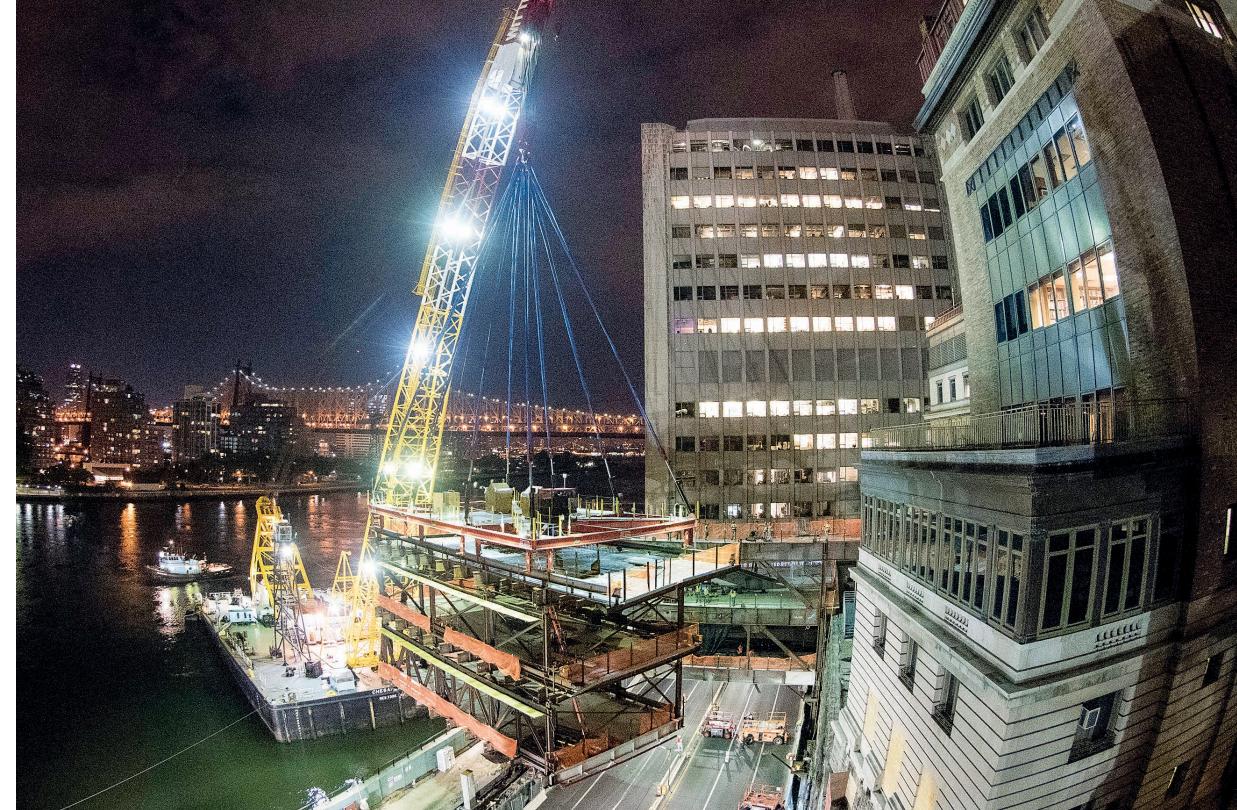
An open-plan design allows labs to be reconfigured as needs evolve

Renovated public esplanade with new paving, furniture, and landscaping

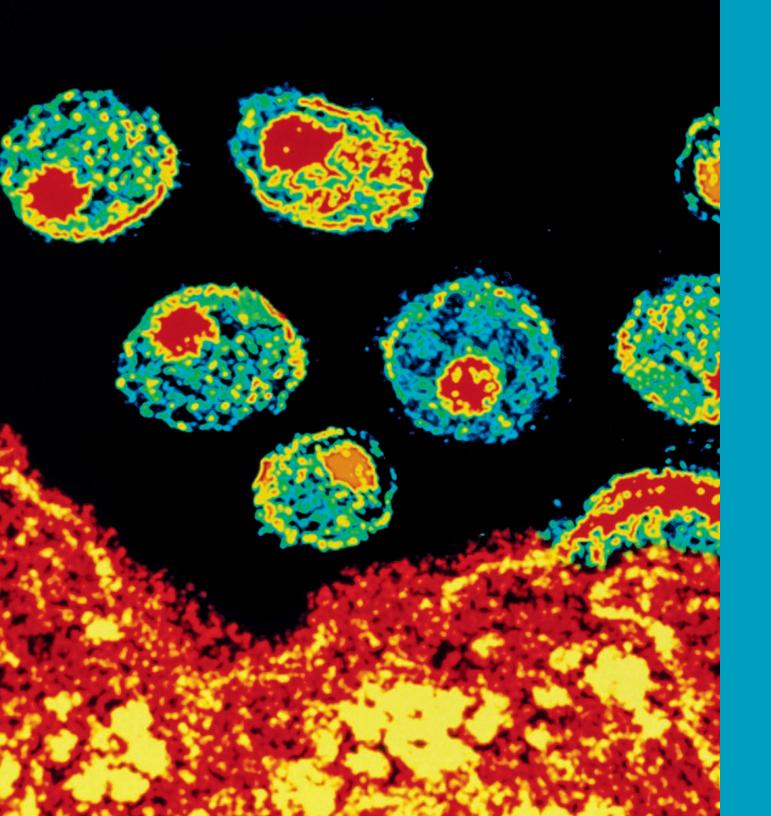
STAVROS NIARCHOS FOUNDATION
STAVROS NIARCHOS
SOUNDATION
SOUNDATION

The SNF-DR River Campus posed a unique engineering challenge: how to build over a busy urban highway serving nearly 150,000 vehicles each weekday. To minimize disruption, the project's steel framework was assembled in New Jersey in 19 enormous modules, then floated up the East River on barges and hoisted into place one at a time by a 1,000-ton marine crane. The structural work was completed in fall 2016.

In 2018, workers built out the laboratories, offices, and common spaces, customizing interiors to the needs of the 18 research groups who are the building's first occupants.







Published in Nature and Nature Medicine, September 2018

Clinical results show HIV antibody therapy is effective for months

Even the best HIV drugs do not entirely eliminate the virus, but merely suppress it for as long as the medication is taken. But new clinical trials suggest that a novel immunotherapy, a combination of two anti-HIV antibodies developed in the lab of Michel C. Nussenzweig, the Zanvil A. Cohn and Ralph M. Steinmar Professor, might do better. In the trial, participants stopped taking antiretroviral drugs and received three infusions of two broadly neutralizing antibodies over the course of six weeks. Among nine individuals whose viruses were sensitive to both antibodies, the treatment suppressed HIV for an average of 21 weeks.

"If future studies are similarly successful, broadly neutralizing antibodies could really become a practical alternative to antiretroviral therapy," says Marina Caskey, who oversaw the trial. "They are safe and wouldn't require a pill every day."

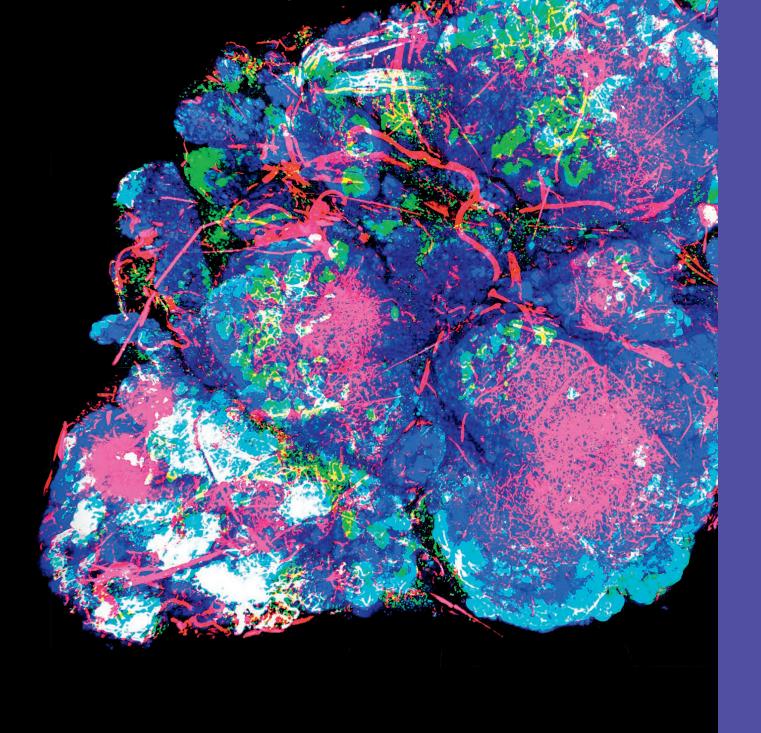


Published in *Nature*, August 2018

Study of ants suggests there are benefits to living in groups

There's typically drama when two similar individuals are forced to share the same space. But there may also be tangible benefits, according to a study of clonal raider ants. Daniel Kronauer, the Stanley S. and Sydney R. Shuman Associate Professor, used cameras and software to track the activities of genetically identical *Ooceraea biroi* ants kept in groups of between 1 and 16 individuals. The larger groups, they found, produced more offspring and experienced greater stability than smaller groups. Even without the context of a colony with queens and workers, group living prompted the insects to specialize in particular tasks.

"Even very simple societies can have an evolutionary advantage over individuals living by themselves," Kronauer says. "These results provide a stepping stone to understanding how complex societies evolved from solitary animals."

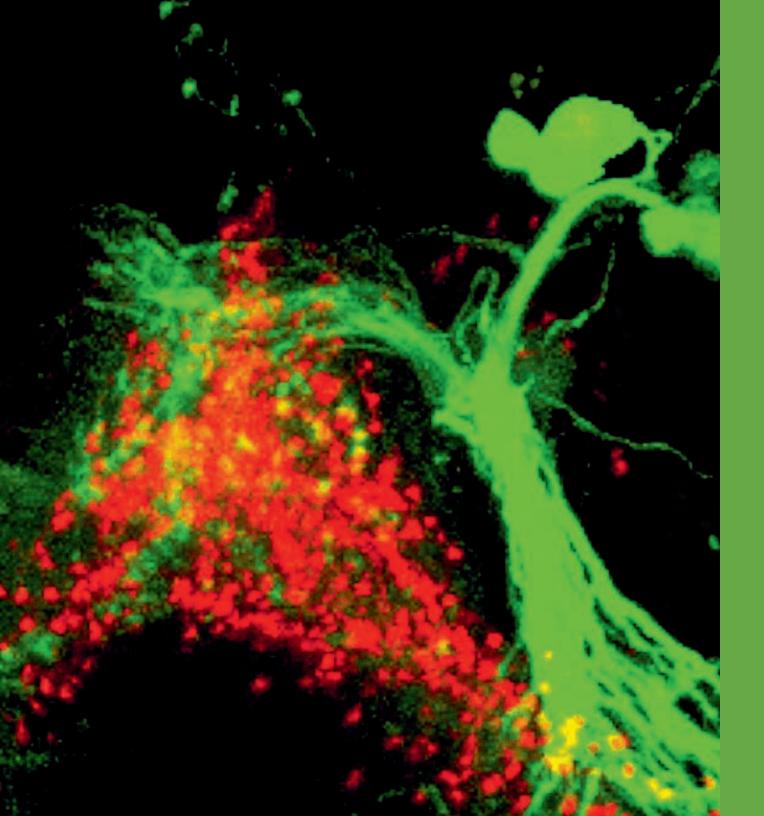


Published in Nature Cell Biology, June 2018

A new tactic to starve tumors: Deprive them of a key component they need to grow

A tumor's goal is to grow fast. Some grow so fast that they outgrow their own blood supply and run low on oxygen. That, in turn, limits their ability to produce metabolites that they need to keep going. New research by Kivanç Birsoy, the Chapman Perelman Assistant Professor, has shown that the lack of one oxygen-dependent metabolite in particular—an amino acid called aspartate—is responsible for stunting much of the growth. Cancer cells that thrive in low-oxygen conditions seem to be obtaining aspartate from the environment.

"This is something they're really starving for, and there may be a way to take advantage of that," says Birsoy. Drugs that would prevent cancer cells from getting aspartate, Birsoy suspects, could be a supplement to traditional cancer treatments, striking tumors in precisely the areas most resistant to chemotherapy and radiation.

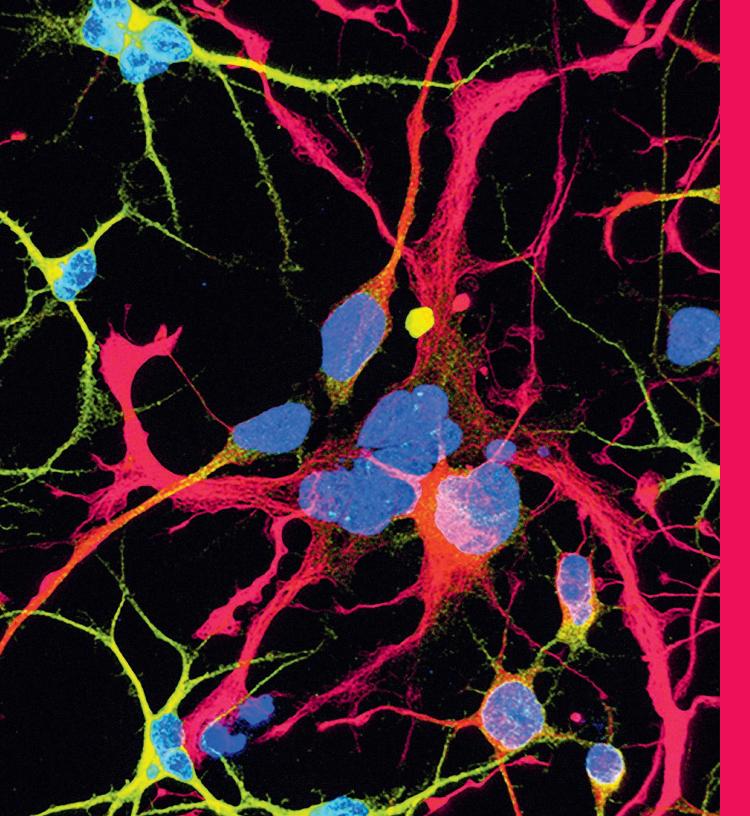


Published in *Nature*, July 2018

Deep in the fly brain, a clue to how evolution changes minds

Male fruit flies court only females of their own species, even when surrounded by closely-related insects. The reason, according to new research from Vanessa Ruta, the Gabrielle H. Reem and Herbert J. Kayden Associate Professor, can be traced to a small cluster of neurons that responds to pheromones. Using CRISPR gene editing tools, Ruta's team found that the same pheromone that attracts a *D. melanogaster* male in fact repulses his *D. simulans* cousin, because it causes an excitatory pathway to dominate in one case and an inhibitory pathway in the other. The findings reveal how evolution has shaped the brain to help ensure that individual species are perpetuated.

"Scientists in the field thought that evolutionary changes would most likely be localized to the periphery of the nervous system, which is also the simplest place to look," says Ruta. "Until recently people have not had the genetic tools available to really trace sensory signals as they propagate through brain circuitry."

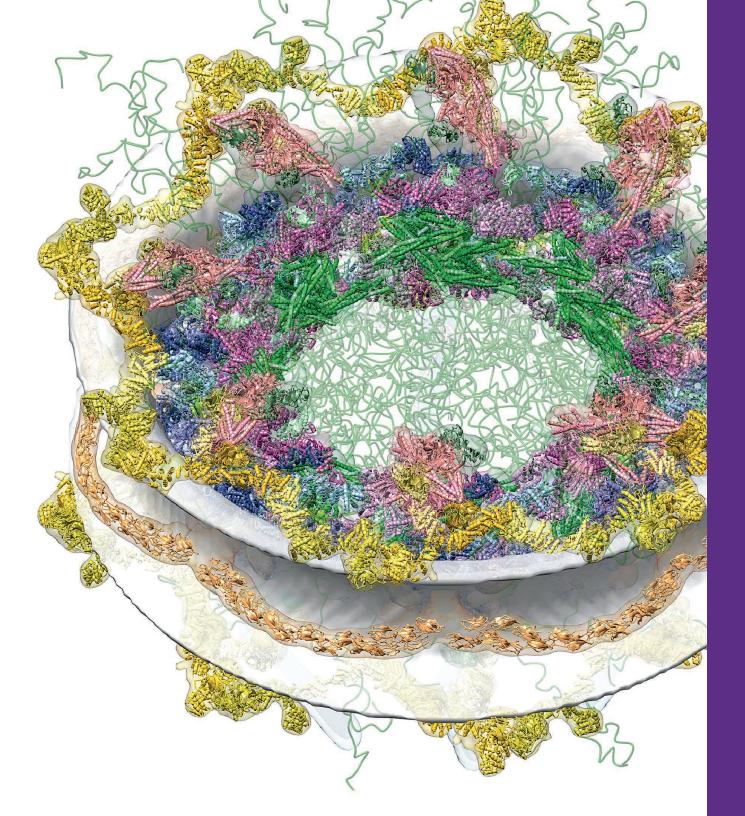


Published in *Development*, January 2018

Huntington's disease may begin in embryonic cells, long before birth

Huntington's disease is preordained: those who have a mutated form of the HTT gene will develop the disease. But new research suggests that the first domino falls soon after fertilization, decades before symptoms appear. Using CRISPR gene-editing technology, Rockefeller scientists engineered a series of human embryonic stem-cell lines that were identical except for their HTT genes. Things started going wrong quickly: the researchers saw deformed neurons with as many as 12 nuclei.

"Huntington's may be both a neurodegenerative disease and a neurodevelopmental disease," says Ali H. Brivanlou, the Robert and Harriet Heilbrunn Professor. The work suggests that rethinking the timing of treatment, as well as the role of HTT, may benefit the search for new Huntington's therapies.



Published in Nature, March 2018

A meticulous 552-piece map reveals details of the cell's nuclear portal

A project to develop a structural diagram of the cell's nuclear pore complex, begun over 20 years ago in the labs of Brian T. Chait and Michael P. Rout, has yielded a spectacular, long-awaited result. The massive complex, made of over 500 component proteins, is crucial to the cell, serving not only as a conduit to and from the nucleus, but also as a checkpoint regulating what passes in and out. Because of its large size and the number of moving parts, no single technique was capable of capturing the nuclear pore complex—Chait, who is the Camille and Henry Dreyfus Professor, and Rout used several approaches and brought all the data together. Their work shows a complicated ringed structure containing rigid, diagonal columns and flexible connectors.

"It reminds us of a suspension bridge, in which a combination of sturdy and flexible parts produce a stress-resilient structure," says Rout. The scientists say their work will enable studies of how the nuclear portal functions normally, and how defects in it lead to diseases such as cancer.



RESOURCES AND TECHNOLOGY

New in 2018: Precision fabrication tools, a third cryo-EM, and improved computational resources

Lab equipment isn't always off-the-shelf; sometimes you need to customize. Although Rockefeller has offered fabrication services for several years, a new 5-axis milling machine acquired in 2017 takes it to a new level. The centerpiece of Rockefeller's new Precision Instrumentation Technologies facility, the milling machine uses rotary cutters to sculpt parts out of stainless steel, aluminum, engineered plastic, or other materials. Its accuracy, to a tolerance of less than eight microns, makes it ideal for creating things like microscope stage adapters, precision-cutting instruments, cellmanipulation tools, and surgical tools.

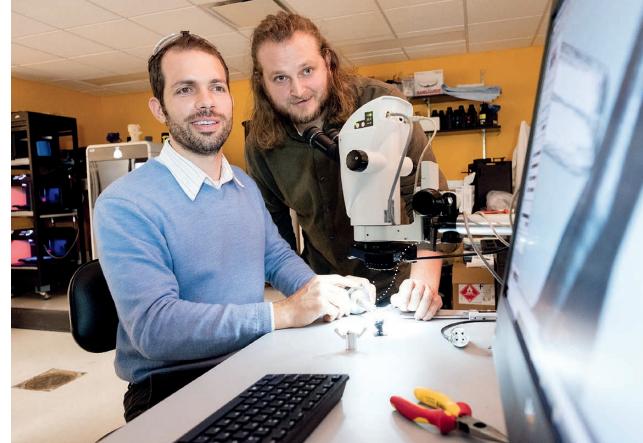
Combined with the shop's other equipment, including 3-D printers and laser cutters, and a full-time engineering staff, the facility builds on Rockefeller's history of creating tools and machinery that move science forward. It was launched with support from the Kavli Neural Systems Institute.



Also acquired in 2017 was a third cryo-electron microscope. The university's two existing cryo-EMs, purchased in 2014, have led to dozens of breakthroughs over the past four years, helping scientists understand the configurations and choreography of a range of previously intractable biological molecules. Some of these molecules are trademarks of deadly diseases, including cystic fibrosis, and are thus important therapeutic targets. But the demand for these capabilities has been substantial, and has led to long waits for time on the machines. The new machine, a 300 kV Titan Krios, will increase the center's capacity and also bring enhanced tomographic capabilities, allowing researchers to see further inside the tangled skein of the most trying proteins.

The university also continues to invest in high-performance computing and bioinformatics, most recently by establishing the Bioinformatics Resource Center, which helps laboratories with processing and analysis of large data sets such as those generated by high-throughput sequencing.











The university's 2018 calendar included lectures, concerts, and a daylong celebration of science

Rockefeller's flagship lecture series, the Insight Lectures, featured talks from Joseph Atick, executive chairman of ID4Africa; and Pulitzer Prize-winner Frances FitzGerald, a journalist who has explored the role of evangelicals in American history. The university's Friday Lecture Series included 31 scientific speakers from throughout the world, and 13 Rockefeller scientists presented Monday Lectures on their recent work. There were also six daylong scientific symposia in 2018, including one honoring the late Peter Model, a Rockefeller emeritus professor, and another in celebration of the 100th birthday of noted neuroscientist Brenda Milner.

Rockefeller awarded two prizes in 2018. The Lewis Thomas Prize for Writing about Science went to Nobel laureate Kip S. Thorne, a theoretical physicist at CalTech who discovered gravitational waves and wrote for lay audiences on the theory of general relativity. Jennifer A. Doudna, a biologist from UC Berkeley who is best known for her work on CRISPR gene-editing technology, was given the Pearl Meister Greengard Prize, which recognizes outstanding women in biomedical research. Both prize recipients presented lectures on their work.

Science Saturday, an annual festival geared to kids in elementary and middle school, drew more than 1,000 children, parents, and teachers to campus, where they watched demonstrations, toured facilities, and participated in hands-on experiments led by Rockefeller scientists. For the seventh year in a row, the university participated in Open House New York; volunteers from the Rockefeller community led guided campus tours for the public focused on Rockefeller's mission, history, and architecture.

Other prominent campus events included: Talking Science, a lecture for high schoolers delivered by Leslie B. Vosshall; Celebrating Science, a benefit featuring Michael W. Young; and lectures by Rod MacKinnon, Jue Chen, Elaine Fuchs, Agata Smogorzewska, and Joel Cohen.





New administrative hires strengthen Rockefeller capabilities in technology transfer, bioinformatics, and information science

Three new leaders, recruited to Rockefeller in international searches, are bolstering the resources available to scientists in areas that are crucial to how discoveries are made and put to use. They bring with them a combined 30 years of expertise in their fields.

Jeanne Farrell

ASSOCIATE VICE PRESIDENT, TECHNOLOGY TRANSFER

Farrell oversees the advancement of the university's commercialization and business development efforts, focusing on building relationships with biomedical and biopharmaceutical partners, expanding interactions with the corporate sector, and attracting venture capital for investment in technologies. She has a Ph.D. from Weill Cornell Medicine, and has worked in similar roles at both Memorial Sloan Kettering and the Mount Sinai Health System, where she was managing director of business development.

Thomas Carroll

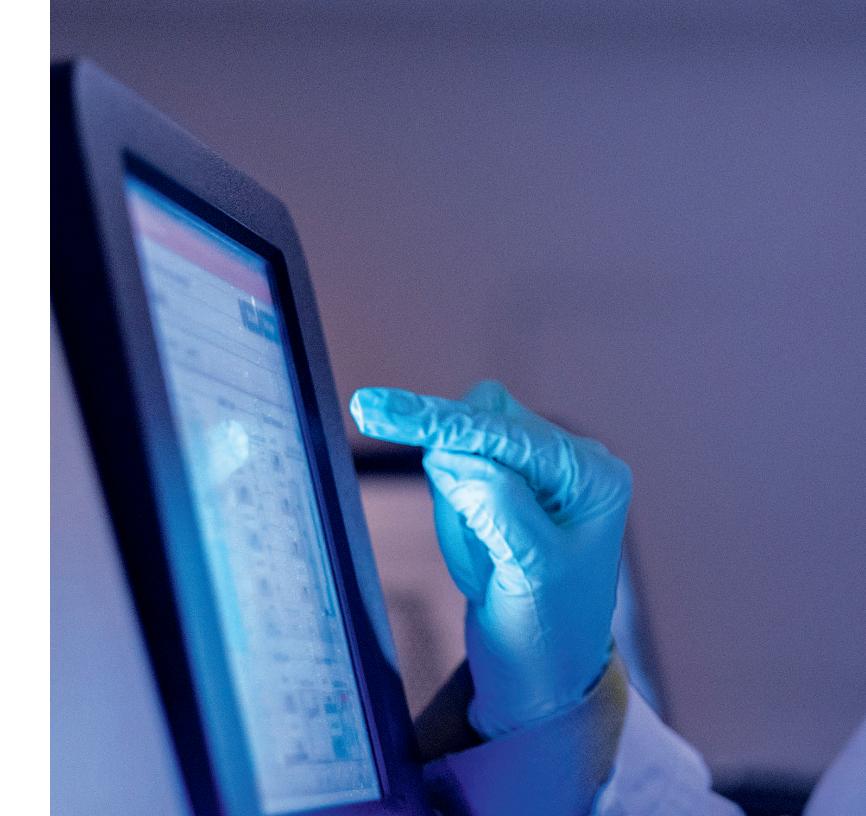
HEAD OF BIOINFORMATICS

Recruited specifically to build and run the university's new Bioinformatics Resource Center, Carroll works with laboratories on bioinformatics analysis, experimental design consultation, and software infrastructure, and conducts training in bioinformatics tools and practices. Carroll has a Ph.D. in toxicogenomics from Kings College in London and has worked as a bioinformatics analyst at several institutions in the UK. He was most recently head of bioinformatics at the MRC London Institute of Medical Sciences.

Matthew V. Covey

UNIVERSITY LIBRARIAN

A biologist and informationist who was previously the librarian at Cold Spring Harbor Laboratory, Covey has spent his career at the intersection biology and informatics, focusing on issues such as data reuse, data accessibility, and data management. He has a Ph.D. in anatomy and structural biology from the University of Otago in New Zealand. In addition to expanding the library's role as a repository for Rockefeller's scientific data, he is working to increase training programs, expand electronic access to resources, and build collaborative relationships with labs.



ROCKEFELLER UNIVERSITY PRESS

RUP journals see continued growth in readership

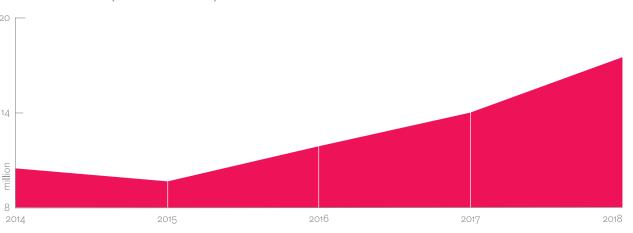
The Journal of Cell Biology (JCB), Journal of Experimental Medicine (JEM), Journal of General Physiology (JGP), and the newly launched Life Science Alliance (LSA) published 577 research articles and 191 commentary articles in 2018, the cumulative work of 4,629 international scientists.

The journals were established by the research community, and editorial decisions and policies are driven by scientists who actively contribute to their fields. Journal staff and scientific editors work closely with academic editors and editorial advisory boards. Combined, 522 scientists contribute to the editorial process and another 2,626 scientists served as reviewers in 2018.

RUP journals are widely read throughout the world: North America represents 40 percent of readership, Europe 28 percent, and Asia 24 percent, with Australia, Central and South America, and Africa representing the remaining 8 percent.

Articles published in RUP journals received a total of 144,401 citations in 2018.

Article downloads (HTML and PDF)



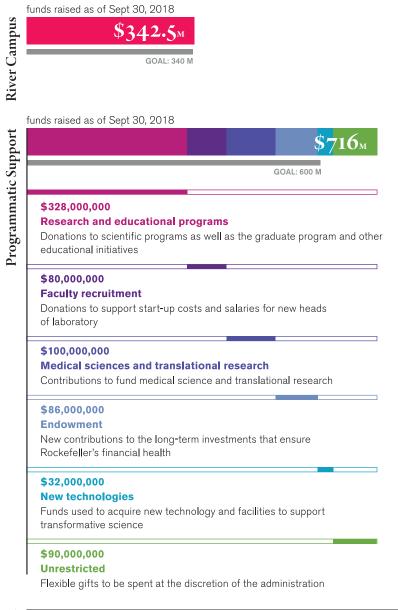


FUNDRAISING

Campaign for Transforming Biomedicine surpasses goal two years ahead of schedule The university's fundraising campaign, which began in 2011 with the goal of raising \$940 million to advance Rockefeller science, closes a year ahead of schedule after exceeding its goal by tens of millions of dollars. The Campaign for Transforming Biomedicine, originally conceived with a nine-year lifespan, will instead close at the end of June of 2019 with over \$1 billion in donations.

Fundraising for the Stavros Niarchos Foundation—David Rockefeller River Campus accounts for about one-third of the funds raised. The remainder has gone directly to programmatic support including faculty recruitment, new scientific programs, translational research, cutting-edge technological tools, and support for trainees.

Trustees contributed more than half of the total, reflecting their close association with the university and its mission. But there have been more than 12,000 donations in all, ranging from just a few dollars to tens of millions.



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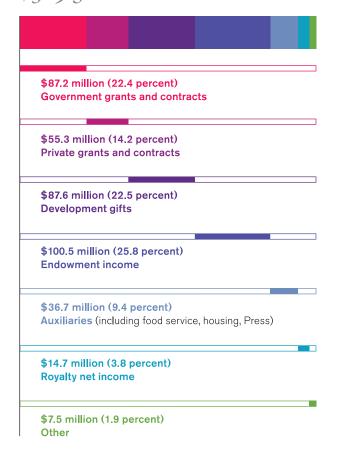
Operating revenue and expenditures, Fiscal Year 2018

The University ended fiscal year 2018 with a modest \$200,000 surplus, which will be directed to a reserve account dedicated to future capital projects. University revenue included an increase in government grants, strong royalty income, and sustained excellent endowment and fundraising performance. Research and education expenses accounted for 64.6 percent of operating expenditures.

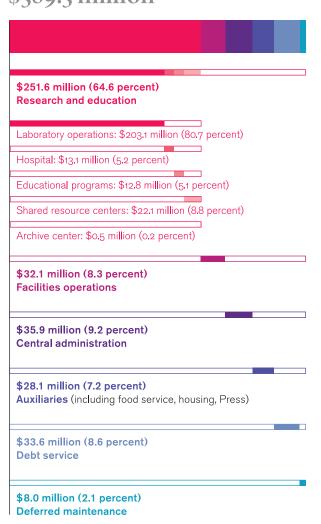
Operating revenue and expenditures, 5 year trend



Operating revenue \$389.5 million



Operating expenditures \$389.3 million



42

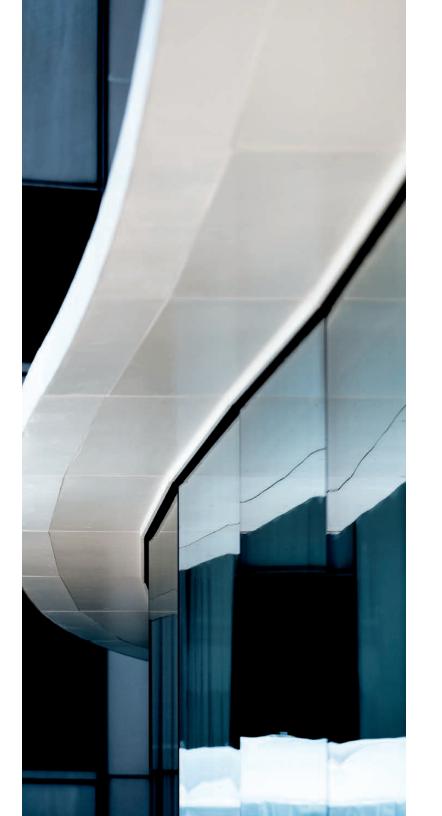
INVESTMENTS

Endowment performance, Fiscal Year 2018

The assets in the endowment were valued at \$2,194.3 million at the close of the 2018 fiscal year. The \$100.5 million draw from the endowment represented 25.8 percent of the university's 2018 budget and remains a critical and stable source of research support.

The endowment generated 11.3 percent for the fiscal year ended June 30, 2018, which is in the top quartile of performance for endowments with over \$1 billion in assets, as ranked by Cambridge Associates. Performance was driven by successful investments in venture capital and real estate and by exceptional outperformance by the university's managers across a broad range of asset classes.

The endowment represents the cumulative generosity of generations of steadfast patrons of transformational science, and the Investments Office invests these assets with the goal of maximizing returns within an acceptable level of risk.

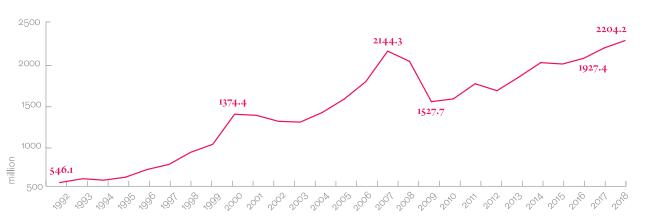


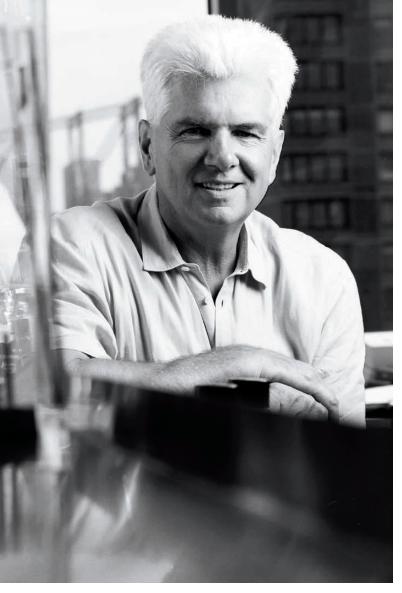
Endowment Highlights

Fiscal Year*	2014	2015	2016	2017	2018	
Market value (millions)	2005.2	1987.0	1927.4	2089.4	2204.2	
Return	17.6%	6.7%	-0.8%	13.3%	11.3%	
Spending (millions)	93.4	94.9	97.9	99.8	100.5	
Operating budget revenues (millions)	350.1	359.8	372.0	388.2	389.5	
Endowment percentage	26.7%	26.4%	26.3%	25.7%	25.8%	

*July 1 through June 30

Endowment Value By Fiscal Year





Günter Blobel 1936-2018

Although he was the recipient of many prestigious awards, including the Nobel, winning prizes was never the point for Blobel. "It's very nice, and everybody claps, and you get a medal you can hang on the wall, but it's not the equivalent excitement that you have when you discover the thing," he once said. Nothing competes with the thrill of science itself.

Blobel, who came to Rockefeller 52 years ago, laid the foundation for the modern field of molecular cell biology, demonstrating that seemingly impenetrable problems could be understood in detail, one molecule at a time. Although he is most commonly credited with demonstrating how newly manufactured proteins are delivered within a cell, his legacy goes far beyond any single discovery. "It was Günter's ability to articulate concepts in ways that can be experimentally tested that set him apart," says former trainee Sandy Simon, now a Rockefeller professor.

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