

OFFICE OF
RESEARCH &
ENGAGEMENT

**ANNUAL
REPORT
FY2017**



THE UNIVERSITY OF
TENNESSEE
KNOXVILLE





LETTER FROM THE VICE CHANCELLOR FOR RESEARCH

The research enterprise at the University of Tennessee, Knoxville, achieved significant increases in several performance metrics in the fiscal year that ended June 30, 2017. Award dollars increased by 8 percent over FY16 and total research expenditures (TREs) increased by 11 percent.

The TREs in FY17 were \$203 million, the largest amount in UT's history. This benchmark amount reflects increases in institutional research funds, federal research expenditures (FREs), and UT's business enterprise.

UT's largest federal funder in FY17 was the Department of Energy, largely due to participation in IACMI-The Composites Institute. IACMI accounted for \$21.6 million of the \$22 million cost share reported by the UT Research Foundation and is the primary source of the increase in FY17 TREs.

In federal fiscal years 2016 and 2017 (October 1–September 30), the federal funding agencies that spent the most on research and development (R&D) were, in descending order, the Department of Defense, Department of Health and Human Services, Department of Energy, National Aeronautics and Space Administration, and the National Science Foundation. In FY17, UT's largest federal expenditures were from, again in descending order, the Department of Energy, NSF, DOD, DHHS, and NASA.

Publication output is another important indicator of research performance. Between 2012 and 2017, the university's number of publications increased by 29 percent in Thomson Reuters' Web of Science and increased by 25 percent in Elsevier's Scopus.

UT is focused on identifying game-changing opportunities that align with our unique research capabilities and expertise. We will strategically target our efforts toward diversifying sources of federal funding, looking to the innovative efforts of our faculty and students and the exciting research discoveries that lie ahead—with teamwork taking us from excellence to *preeminence*.

Victor R. McCrary
Vice Chancellor for Research

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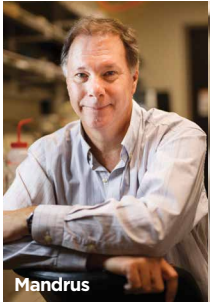
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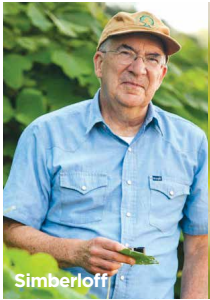
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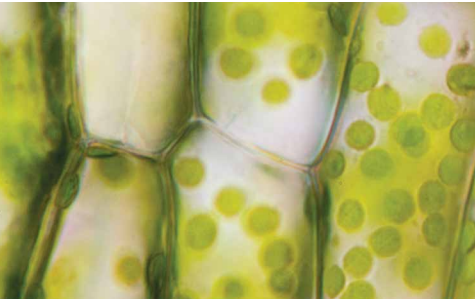
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Mandrus



Simberloff



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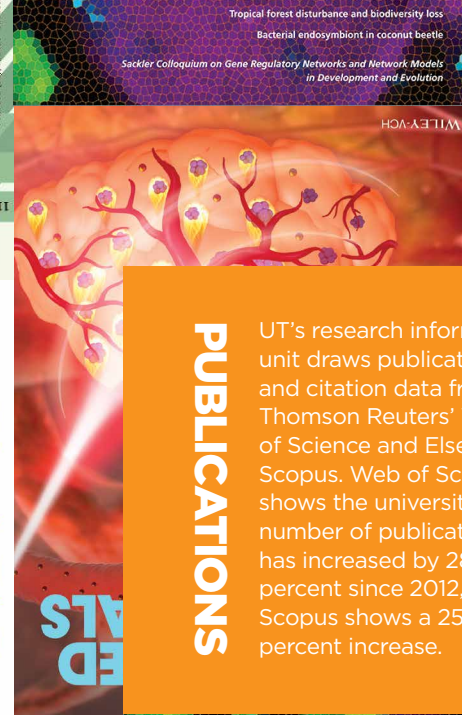
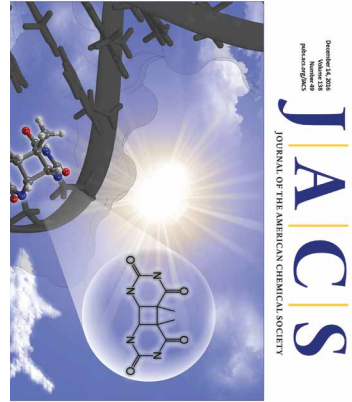
Two UT faculty members have earned the distinction of being among the most cited researchers in the world, according to Clarivate Analytics (formerly Thomson Reuters).

Gore Hunger Professor of Environmental Science in Ecology and Evolutionary Biology **Daniel Simberloff** and Jerry and Kay Henry Endowed Professor of Materials Science and Engineering **David Mandrus** have each been recently recognized for their contributions to science.

Simberloff's work centers around the study of invasive species, coexistence of species, and how

species can differ depending on other organisms in their environment. His research has been cited more than 60,000 times.

Mandrus's research involves discovering new materials related to electronics and magnetics, such as superconductors and thermoelectrics. A fellow of the **American Physical Society**, Mandrus has seen his work cited more than 6,000 times.



PUBLICATIONS

UT's research informatics unit draws publication and citation data from Thomson Reuters' Web of Science and Elsevier's Scopus. Web of Science shows the university's number of publications has increased by 28.8 percent since 2012, while Scopus shows a 25.07 percent increase.

FACULTY RESEARCH HIGHLIGHTS

Michelle Brown conducts groundbreaking research into the United States prison system, including the representation of incarceration in the media and popular culture. A prolific scholar, she is completing her fourth book, which will examine how the US criminal justice system might be transformed through social justice-oriented alternatives to mass incarceration.

She is also working to create a virtual archive that will provide a current history of the death penalty abolition movement and

demonstrate which strategies are the most effective in building support for the movement.

In 2016, Brown received the **American Society of Criminology's** Critical Criminologist of the Year award.

Brown is an associate professor of sociology.

Mark DeKay is helping to combat expanding energy consumption and global warming through sustainable architecture, with a focus on climactic and daylight analysis and

environmentally responsive design.

He is the author of two critically acclaimed books: *Sun, Wind and Light: Architectural Design Strategies*, the leading text on sustainable design, and *Integral Sustainable Design: Transformative Perspectives*.

DeKay's theories and design strategies are being explored and tested by academies in South Africa and Australia. Additionally, he is a co-author of a continuing education program in green building for professionals and the developer

of a game that explores net-zero energy design strategies.

DeKay is a professor of architecture and design.

Robert Grzywacz recently headed the effort that led to the discovery of a new chemical element—No. 117, a halogen named Tennessine. He developed a process to measure the decay of nuclear materials down to one millionth of a second, which was vital to the project. The discovery of super-heavy elements allows for the possibility of studying the heaviest known

nuclear island of stability.

Grzywacz frequently collaborates with physicists from Oak Ridge National Laboratory and other top research facilities around the world, and much of his work is funded by the US Department of Energy.

In 2016, he was elected a fellow of the American Physical Society, an honor given to only 0.5 percent of APS members. He is the author of more than 220 refereed papers.

Grzywacz is a professor of physics.

Yilu Liu works to make the nation's power grid more secure, reliable, and efficient.

Along with other researchers at UT and ORNL, Liu developed the FNET/GridEye system to help monitor the power grid in real time. It detects and locates power grid events through GPS time synchronization technology, enabling operators to make split-second decisions about failures, increased loads, and other issues.

In recognition of Liu's accomplishments, she was inducted as a fellow of

the **National Academy of Inventors** in 2016. The academy cited her spirit of innovation and the impact her efforts have made on everyday life.

Liu is the UT-ORNL Governor's Chair for Power Electronics.



Brown



DeKay



Grzywacz



Liu

UNDERGRADUATE RESEARCH HIGHLIGHTS

Undergraduates **Kimberly Bress**, **Christopher Neal**, and **Andrew Wintenberg** were named 2017-18 Goldwater Scholars.

One of the most prestigious scholarship programs for undergraduates, the **Goldwater Scholarship** encourages outstanding students to pursue careers in mathematics, the natural sciences, and engineering.

Since 2006, UT has had 17 Goldwater Scholars.



Bress



Neal



Wintenberg

Three UT students were named 2017 winners in the **Undergraduate Awards**, sometimes referred to as the junior Nobel Prize. It is the world's largest international academic awards program, recognizing excellent research and original work in the sciences, humanities, business, and creative arts.

Alexandra Brito, a May 2017 graduate, was named a Global Winner in the language and linguistics category for her research on the impact of two different foreign-language learning environments—traditional classroom exposure and immersion learning through study abroad—on differences in brain processing

in people learning French.

Sierra Roark, also a May 2017 graduate, was named a Regional Winner in the category of classics and archaeology. She studied wood charcoal collected from the archaeological excavation of a 17th-century colonial site in Virginia to better understand how people interact with their environment.

Rachel Hunt, a senior in interior architecture, was named Highly Commended in the architecture and design category for her study of bioluminescent organisms and how they use light to set a schedule and react to environmental changes. Her research has been applied to working environments in research

facilities, where changes in lighting relative to the natural circadian rhythm may help employees work more efficiently.

All three students were invited to Dublin, Ireland, to receive their awards and attend seminars with peers and leaders in their fields.



Brito



Roark



Hunt

Amber MacDonald grew up playing sports and thought she wanted to be a personal trainer. But her father's diagnosis of terminal colorectal cancer when she was 15 changed the course of her life.

Inspired by her father, who died while she was still in high school, MacDonald spent three years researching the link between nutrition and cancer. She received her master's degree in cellular molecular nutrition, earned in UT's College of Education, Health, and Human Sciences, in May 2017.



MacDonald

Three UT undergraduates are researching Rett syndrome, a rare progressive neurological disorder that afflicts mostly women and girls. They want to raise awareness about the disorder and hope their discoveries translate into improved care for patients.

Izabella Nill Gomez, **Taryn Lester**, and **Ashlee Tannehill** are working in the lab of Keerthi Krishnan, assistant professor of biochemistry and cellular and molecular biology.

Rett syndrome is not inherited but results from a random spontaneous gene mutation. It leads to impairments affecting nearly every aspect of life, including the ability to speak, walk, eat, and breathe easily.



Gomez



Lester



Tannehill



NEWS

In February 2017, UT signed a memorandum of agreement with the Atmospheric Turbulence and Diffusion Division of the National Oceanic and Atmospheric Administration's Air Resources Laboratory to advance collaborative research in atmospheric sciences.

The agreement is facilitating joint efforts to advance understanding of air pollution, atmospheric transport processes, and weather on a regional and national level. It is also creating educational opportunities for undergraduate and graduate students to collect scientific data, develop models and simulations,

and transition research to applications and commercial use.

Nine UT students—the largest number to date—were offered prestigious Fulbright US Student Program awards for the 2017-18 academic year to study and teach in cities around the globe.

Andrew Seidler, director of UT's Office of National Scholarship and Fellowships, said this was a record-setting year for UT in the program, with the largest number of awards offered and semifinalists in UT history.

"I'm thrilled for the students and for UT. Having this much participation and success in the Fulbright

competition says a lot about how our students are increasingly seeing the Fulbright as an important and attainable pursuit," Seidler said, noting that the past year saw 42 students—the most ever—apply for Fulbrights.

A team led by UT researchers was selected by NASA as part of an overall investment of nearly \$50 million to lead the next aviation revolution. In addition to those from UT, the team is composed of researchers from Pennsylvania State University, Texas A&M University, the University of Illinois Urbana-Champaign, Old Dominion University, the University of Wyoming, and

two aviation companies—the Boeing Corporation and Airfoils Inc.

The goal of UT's team is to produce much more aerodynamically capable aircraft, with NASA providing \$9.9 million for the efforts upon final negotiations. It is believed to be the largest NASA award ever for a UT-led project.

The goal of the combined effort is to provide breakthroughs that totally reshape aviation by improving flight dynamics, communications, speed, and propulsion. Advancements are expected to alter the look, cost effectiveness, safety, and reliability of aviation.

DATA SUMMARY

The data for this report was run on May 15, 2018. It includes research expenditures from the University of Tennessee, Knoxville, and UT Space Institute during fiscal year 2017 as reported to the National Science Foundation. Comparison data from previous years is drawn from NSF sources.

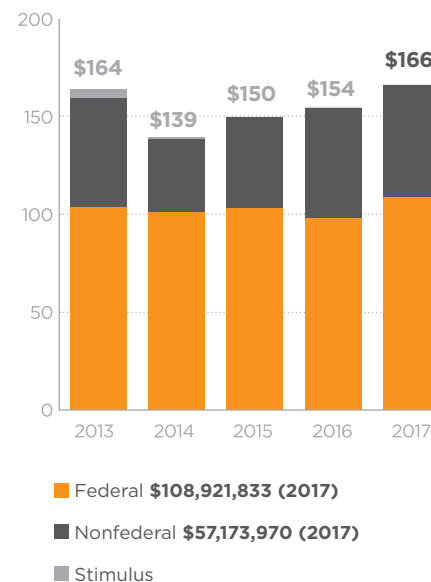
For the first time in the university's history, TRES surpassed the \$200 million mark.

This is largely due to increases in institutional funds, FREs, and UT's business enterprise. The university saw an 11 percent increase in TRES and a 7 percent increase in FREs over FY16.

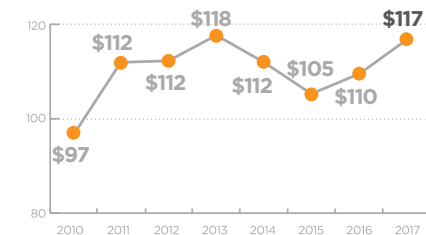
Several technology transfer metrics also marked significant increases. UT and UTSI faculty contributed to a significant increase in the number of patents filed in FY17, which resulted in a 58

percent increase in the number of patents issued. Also on the rise was the amount of revenue generated from license and option agreements, with a 59 percent increase over FY16.

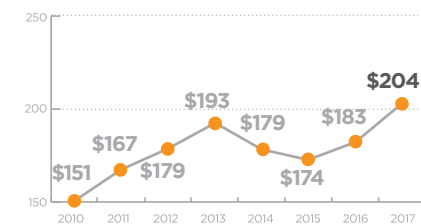
Sponsored Research Dollars by Sponsor Type (IN MILLIONS)



Federal Research Expenditures (IN MILLIONS)



Total Research Expenditures (IN MILLIONS)



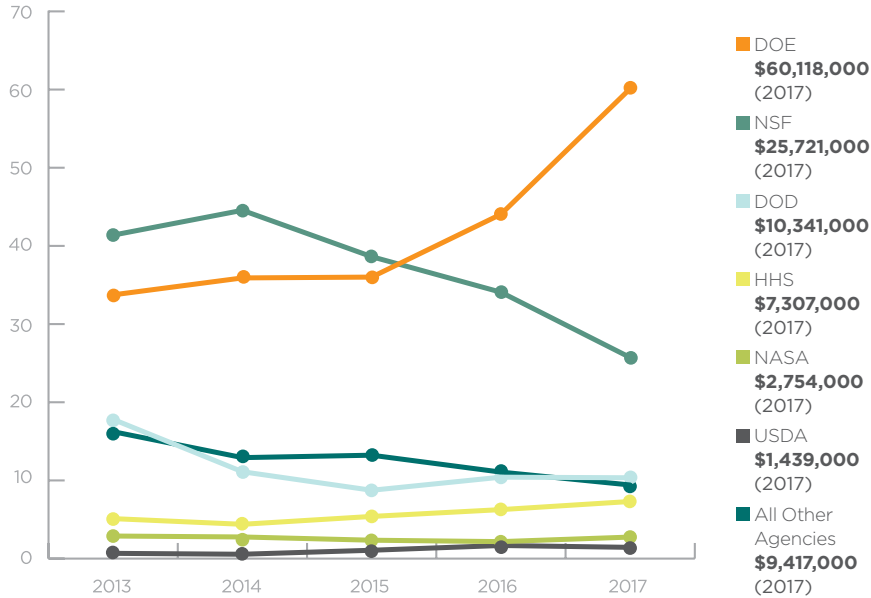
Total Research Expenditures by Source of Funds



- Federal (FREs) **\$117,097,000**
- Institutional funds **\$62,268,000**
- State and local government **\$13,299,000**
- Business **\$6,248,000**
- Nonprofit organizations **\$2,587,000**
- Other sources **\$2,301,000**

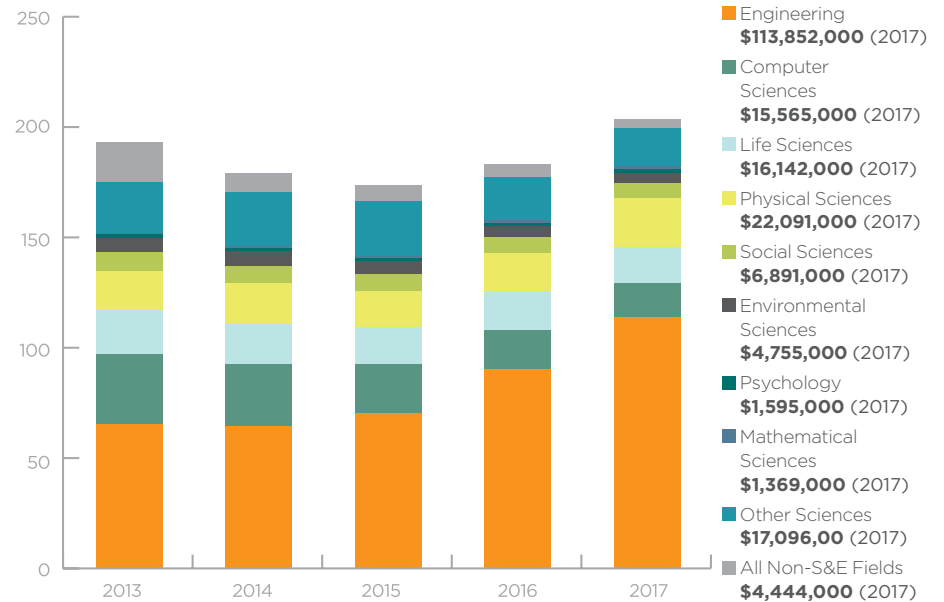
Federal Research Expenditures by Agency

(IN MILLIONS)



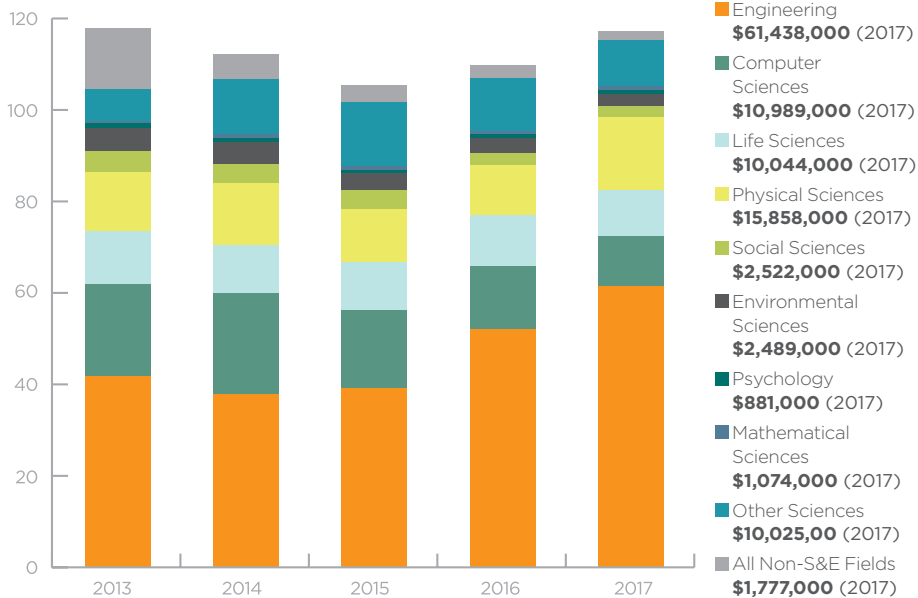
Total Research Expenditures by R&D Field

(IN MILLIONS)



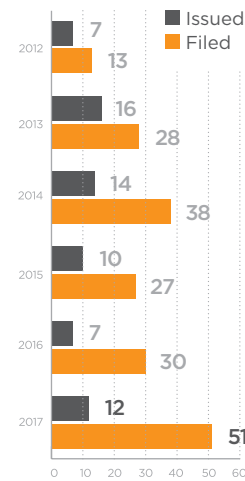
Federal Research Expenditures by R&D Field

(IN MILLIONS)

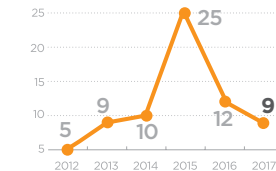


Technology Transfer

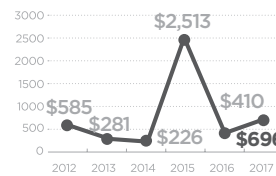
PATENTS



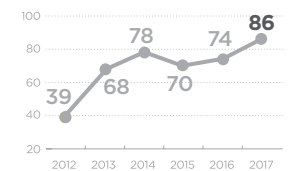
LICENSES AND OPTIONS



REVENUE (in millions)



INVENTION DISCLOSURES



Since 2012, UT has launched seven student startups.

HUMANITIES AWARDS

BY CALENDAR YEAR

2016

American Council of Learned Societies: Fellowship

Belfer Center for Science and International Affairs, Harvard: Grant

Fulbright: Five Core US Scholar awards

Getty Center: Library grant

National Endowment for the Humanities: Two summer stipends

National Humanities Center: Fellowship

Schomberg Center (New York Public Library): Fellowship

2017

American Council of Learned Societies: Fellowship

American Philosophical Society: Franklin Award

American School of Classical Studies at Athens: Kress Publication Fellowship

Carnegie Foundation: Fellowship

Fulbright: Three Core US Scholar awards

Huntington Library: Short-term fellowship

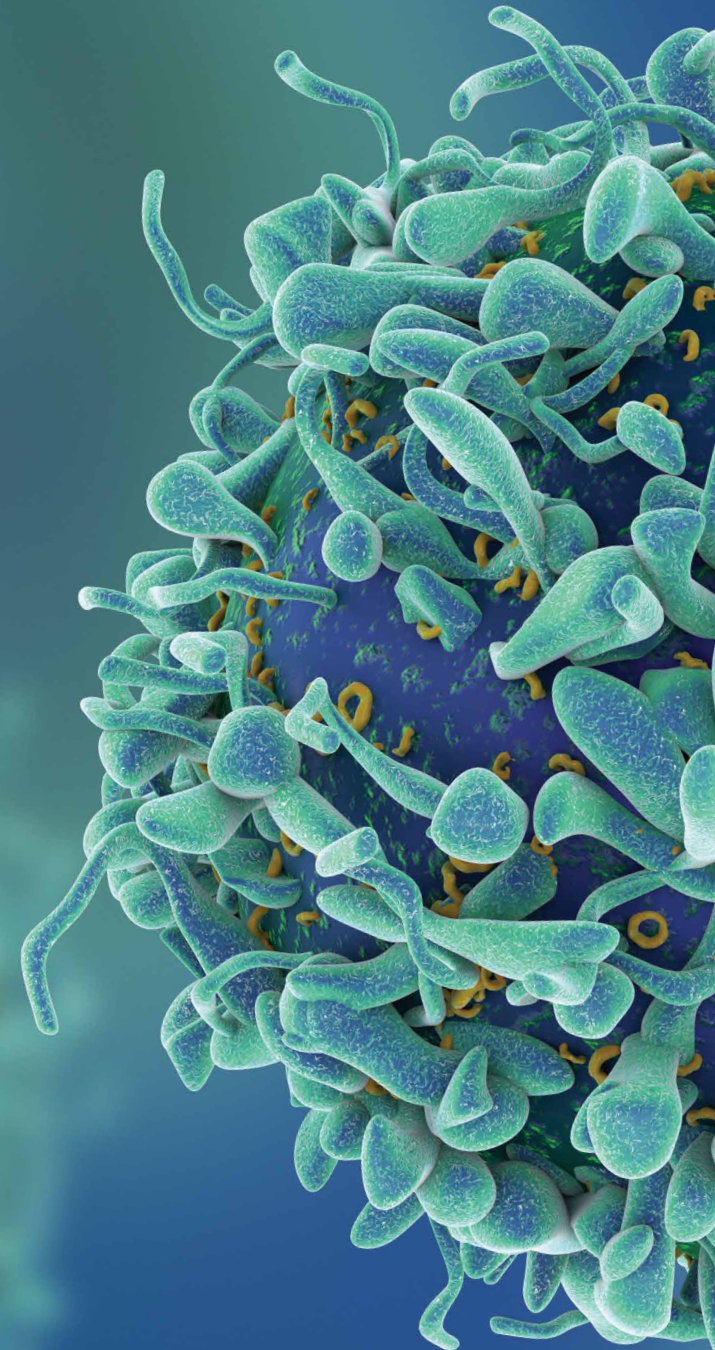
National Endowment for the Humanities: Fellowship, summer stipend

National Humanities Center: Fellowship (declined)

Newberry Library: Short-term fellowship

Russell Sage Foundation: Fellowships

Smith College: Mortimer Fellowship





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