EXTREME TALENT. RADICAL COLLABORATION. RESULTS THAT MATTER.

Cornell Research

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Cover Caption
In Cornell's Autonomous Systems Lab, a graduate student models a pair of glasses that mirror a computer screen, providing the user with a heads-up display as he communicates with a robot on a search-and-rescue mission.

Cover & Contents Photo Credits
Robert Barker/CU, Frank DiMeo, Lindsay France/CU

January 2014

This collection of quick facts, research highlights, and statistics includes Cornell Research activity selected from FY 2013, FY 2012, and FY 2011.

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RESULTS THAT MATTER

When I pause to appraise Cornell research—its ambitious goals and outstanding achievements—I am amazed by the scope of what gets accomplished here and struck by how successfully our researchers and scholars advance fundamental understandings, create new technologies, and achieve breakthroughs.

Cornell research brings immediate and long-term benefits to people around the world, enriching the human condition. Whether engineers; physicians; physical, social, or life scientists; scholars in the classics; or researchers in entrepreneurship or hotel administration, our faculty do work that improves every facet of our lives. They continue Cornell's long tradition of combining scholarly work and research leadership with serving the public at home and around the world.

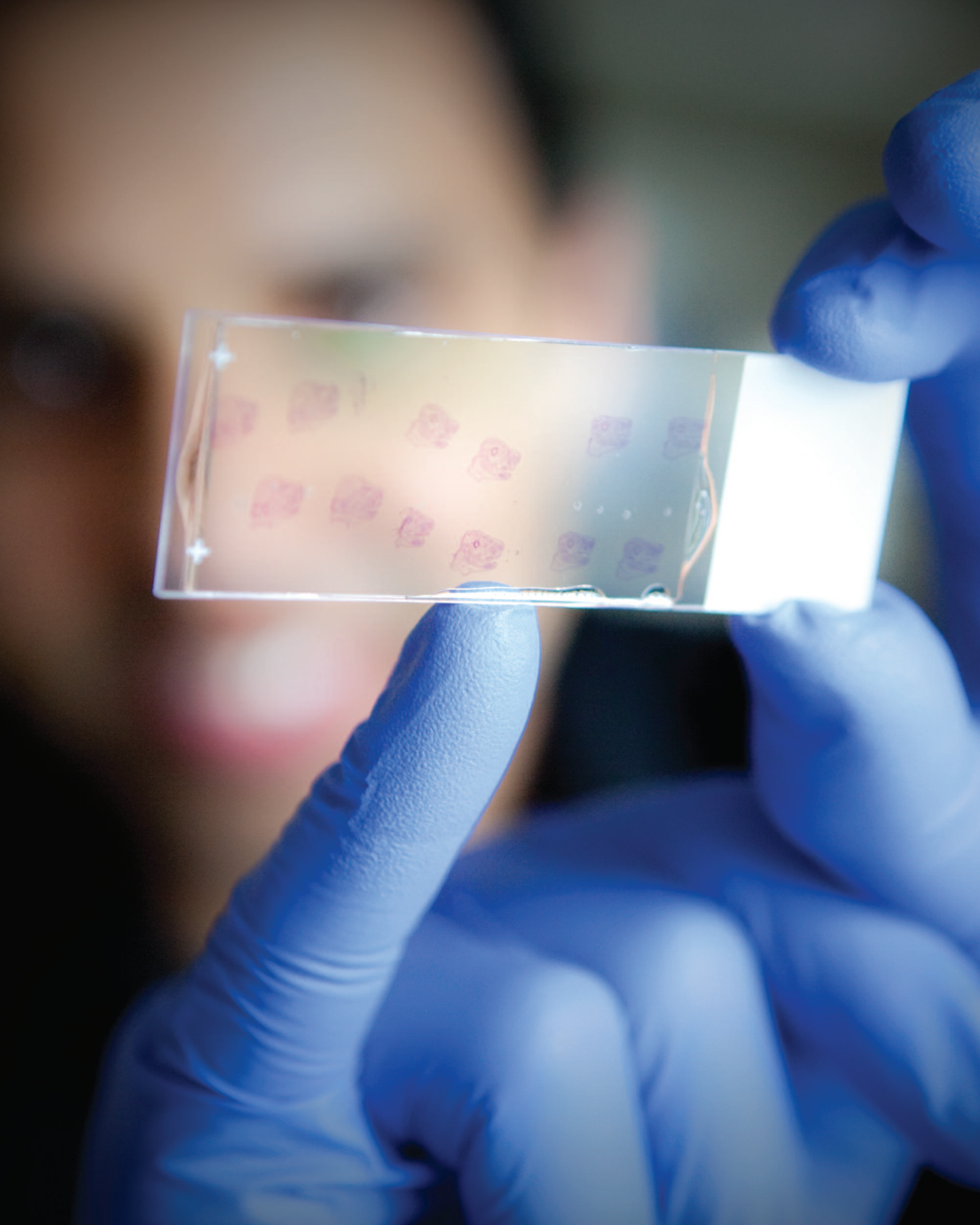
The three statements on our cover describe the heart and soul of Cornell research. Our faculty, graduate students, and undergraduate researchers are indeed extremely talented. They perform well above and beyond the expected in their chosen areas of research and scholarship for the sake of creating new knowledge and serving humanity. They conduct groundbreaking research–oftentimes coming together from several disciplines at the university or working with communities in New York State or on another continent–to find answers to challenges that have until now escaped solution.

On one quad of the Cornell campus, we find engineer Michal Lipson, a MacArthur "genius" fellow who's working with one physics colleague on synchronizing nanomechanical devices for use in nanoscale integrated circuits and starting a company with another colleague across campus to commercialize new photonic inventions. Lipson has invented many technologies based on moving and manipulating light, working to launch the next generation of technologies for transmitting information faster than ever before, including interconnecting nanoelectronic circuits at the speed of light to enable future generations of more powerful supercomputers.

On another quad, we encounter internationally recognized scholar Chris Barrett, who spends time in Africa working on reducing poverty and food insecurity. Barrett collaborates extensively across fields and institutions and within the East African communities where he works searching for solutions such as Index Based Livestock Insurance (IBLI), an innovative insurance program for poor livestock keepers.

Cornell research brings immediate and long-term benefits to people around the world, enriching the human condition.

PHOTO: JASON KOSKI/CU



Under the campus, beneath parking lots and sports fields, we can take an elevator down to one of our world-class facilities, the Cornell High Energy Synchrotron Source (CHESS), and see physical and life scientists, engineers, and sometimes even artists working together to harness the power of intense beams of x-rays in order to probe more deeply into nature and human creations. The study of new materials for advanced fuel cells, cancer research, and art restoration are just a few kinds of research projects that we find there, along with a world-leading team of accelerator scientists who are developing the technologies that will soon provide us with even more intense x-ray sources.

Our colleagues in New York City are engaged in research centers like the Feil Family Brain and Mind Research Institute, a multidisciplinary translational neuroscience center at Weill Cornell Medical College, as well as innovative entrepreneurial ventures like Cornell NYC Tech, melding engineering education, technology, and entrepreneurship.

Weill Cornell Medical College faculty member Lewis Cantley, a Cornell PhD, is on the leading edge of cancer research. This year he won a Breakthrough Prize in Life Sciences—one of the first 11 awarded. Scholars like historian Fredrik Logevall open up new perspectives in history and other areas of the humanities. Logevall won the 2013 Pulitzer Prize in history for his book *Embers of War: The Fall of an Empire and the Making of America's Vietnam*.

Physicist Craig Fennie in Ithaca and physiologist Sheila Nirenberg at Weill Cornell Medical College are 2013 MacArthur "genius" fellows. Fennie crosses the disciplinary boundaries of condensed matter physics and solid-state chemistry to discover new materials with electric, optical, and magnetic properties. Nirenberg studies how the brain encodes visual information as she develops innovative prosthetic solutions for restoring sight after medical conditions such as macular degeneration and retinitis pigmentosa.

Early career faculty are also driving innovation at Cornell. Physicist Kyle Shen, a winner of a Presidential Early Career Award for Scientists and Engineers as well as Naval, Air Force, and National Science Foundation Early Career Awards, studies exotic new materials, such as new types of superconductors with unusual electronic and magnetic properties. Microbiologist Ruth Ley, also an early career multi-award winner, investigates the evolution of gut bacteria and is making remarkable connections between these bacteria and our health.

No matter where we go at Cornell, we encounter extremely talented researchers deeply engaged in pioneering research. And while these faculty researchers are exemplary in their chosen disciplines, they also work collaboratively in centers and with research colleagues in different fields, a distinctive hallmark of Cornell research.

We have a multidimensional kind of research collaboration at Cornell that takes place at many levels across a multitude of disciplines and scales, and we do it instinctively. It's a radical departure from the ordinary approach to problem solving. It allows us to pull together extremely talented researchers and scholars to tackle the most puzzling and daunting challenges of a highly complex, diverse world. And in the end, we deliver results that matter.

Robert A. Buhrman

ROBERT A. BUHRMAN
Senior Vice Provost for Research

PHOTOS: FRANK DIMEO, LINDSAY FRANCE/CU

CORNELL RESEARCH QUICK FACTS & STATS

FUNDING, FY 2012 *(dollars expended)*

$802 MILLION
Total Funding

$466M
Federal
Sponsored Funding

$130.9M
Nonfederal
Sponsored Funding
+ 12% (over FY 2011)

Top Sources of Funding for Cornell Research

$233M
Department of Health and Human Services

$130M
National Science Foundation

% Cornell's
Total External
Research Funding

#3

Cornell rank in NSF university
research funding

ENDOWED COLLEGES*
30%

CONTRACT COLLEGES
33%

MEDICAL COLLEGE
37%

* Includes Research Division

INNOVATIONS, FY 2013

395

New technologies disclosed

581

Patents filed

170

Patents issued

162

Licenses negotiated

8

New companies formed

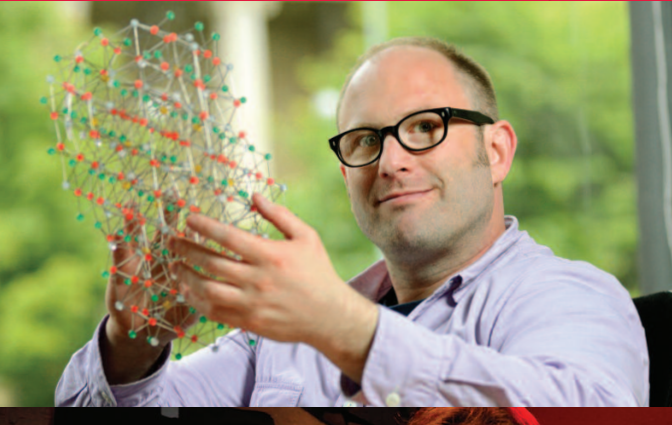
25

Start-ups were formed between FY 2011 and FY 2013

GENIUS AWARD

John D. and Catherine T. MacArthur Fellowship

Cornell Faculty won two awards in 2013—Craig J. Fennie, Applied and Engineering Physics, and Sheila Nirenberg, Physiology and Biophysics, Weill Cornell Medical College.



FACULTY

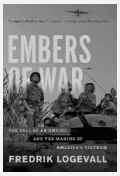
209 Cornell Faculty Memberships in the National Academies in FY 2013

14	94	45	29	23	4
American Philosophical Society	American Academy of Arts and Sciences	National Academy of Sciences	National Academy of Engineering	Institute of Medicine	American Academy of Arts and Letters

31

Cornell faculty members were elected to the national academies between 2010 and 2013

Breakthrough Prize in Life Sciences
Lewis C. Cantley, Medicine/Director of the Cancer Center at Weill Cornell Medical College, was a winner of this $3 million inaugural prize.



2013 Pulitzer Prize for History
Fredrik Logevall, History, won the Prize for his book, *Embers of War: The Fall of an Empire and the Making of America's Vietnam* (Random House, 2012).

Cornell's Young Faculty in 2012

2	12	SEVEN
Presidential Early Career Awards for Scientists and Engineers (PECASE)	NSF Faculty Early Career Development Awards	Other young investigator awards (DARPA Young Faculty Award, Air Force Young Investigator Award, Office of Naval Research Young Investigator Award, Beckman Foundation Young Investigator Award)

President's National Medal of Science (faculty)

9
MacArthur Genius Award (faculty)

41
Nobel Prize (faculty and alumni)

PHOTOS: FRANK DIMEO, JOHN D. AND CATHERINE T. MACARTHUR FOUNDATION, WCMC

GRADUATE RESEARCH FUNDING, FY 2012

$47.7M	$31.3M	$3.8M	$11.2M	$1.3M	1,060
Total Funds	Federal	Nonfederal Sponsored	Cornell appropriated	New York State	Total number of research graduate students

$4.1M	408 Students $2.6M	108 Students $1.1M	2 Students $3.6K	27 Students $415K	545
Total Funds	Graduate	MD/PhD	Visiting graduate	Visiting graduate assistants	Total number of research graduate students

INTERDISCIPLINARY RESEARCH CENTERS AND FACILITIES

100+

Number of Centers, Institutes, and Laboratories

Cornell NanoScale Science and Technology Facility
Cornell High Energy Synchrotron Source

National Research Centers

Feil Family Brain and Mind Research Institute is a new, unique multidisciplinary translational neuroscience research hub at Weill Cornell Medical College, established April 2013.

Dr. Costantino Iadecola, Director

PHOTOS: ROBERT BARKER/CU, WCMC

STATE-OF-THE-ART RESEARCH AND TEACHING FACILITIES

CORNELL'S RANK AMONG WORLD UNIVERSITIES, 2013

7
Computer Science

1
Physics

1
Overall

Source: Academic Ranking of World Universities

Methodology includes indicators of research output, e.g. highly-cited research, number of published papers, and prizes and medals.

LINDSAY FRANCE/CU

RANKING CORNELL RESEARCH, FY 2012

by Research Expenditures

/ dollars in thousands

Nationally

1. JOHNS HOPKINS UNIVERSITY* **$2,106,185**
2. UNIVERSITY OF MICHIGAN **1,322,711**
3. UNIVERSITY OF WISCONSIN **1,169,779**
4. UNIVERSITY OF WASHINGTON **1,109,008**
5. UNIVERSITY OF CALIFORNIA, SAN DIEGO **1,073,864**
6. UNIVERSITY OF CALIFORNIA, SAN FRANCISCO **1,032,673**
7. DUKE UNIVERSITY **1,009,911**
8. UNIVERSITY OF CALIFORNIA, LOS ANGELES **1,003,375**
9. STANFORD UNIVERSITY **903,238**
10. COLUMBIA UNIVERSITY **889,487**
11. UNIVERSITY OF NORTH CAROLINA **884,791**
12. UNIVERSITY OF PITTSBURGH **866,638**
13. UNIVERSITY OF PENNSYLVANIA **847,077**
14. UNIVERSITY OF MINNESOTA **826,173**
15. MASSACHUSETTS INSTITUTE OF TECHNOLOGY **824,130**
16. CORNELL UNIVERSITY **802,387**
17. HARVARD UNIVERSITY **799,432**
18. PENNSYLVANIA STATE UNIVERSITY **797,679**
19. OHIO STATE UNIVERSITY **766,513**
20. UNIVERSITY OF CALIFORNIA, BERKELEY **730,348**

In New York State

1. COLUMBIA UNIVERSITY **889,487**
2. CORNELL UNIVERSITY **802,387**
3. NEW YORK UNIVERSITY **458,645**
4. ICAHN SCHOOL OF MEDICINE AT MOUNT SINAI **400,680**
5. UNIVERSITY OF ROCHESTER **389,612**
6. SUNY–BUFFALO **360,226**
7. ROCKEFELLER UNIVERSITY **292,896**
8. YESHIVA UNIVERSITY **289,027**

* Johns Hopkins University includes Applied Physics Laboratory, with $1,121,483 thousand in total R&D expenditures in FY 2012.
Source: National Science Foundation, National Center for Science and Engineering Statistics, Higher Education Research and Development Survey

PHOTOS: JASON KOSKI/CU, UNIVERSITY PHOTOGRAPHY

RESEARCH HIGHLIGHTS

EXTREME TALENT RESULTS THAT MATTER

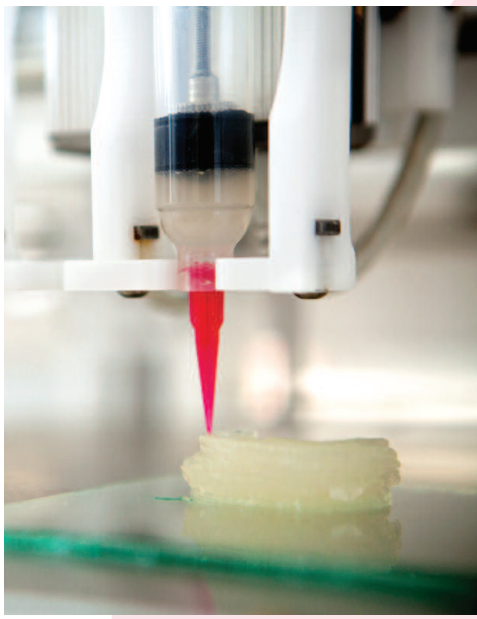
Because of Cornell's distinctive combination of depth, breadth, reach, and boundary-spanning connectivity among disciplines and institutions, Cornell faculty and their labs produce research beyond the expected, making discoveries and creating new technologies. They are researchers and scholars of extreme talent.

Cornell faculty labs include many graduate and undergraduate students and other researchers, working together and across disciplines to deliver results that matter. Only a fraction of the outstanding research taking place at Cornell is presented here.

FRANK DIMEO/CU

SECURING OUR HEALTH

From therapeutics for Alzheimer's disease to implantable discs for the spinal column to the health of caregivers, researchers from across many disciplines at Cornell are working to protect and ensure our best health. Cornell faculty labs are making discoveries and creating new technologies for disease control and prevention and related societal issues. Here are a few examples of this work.



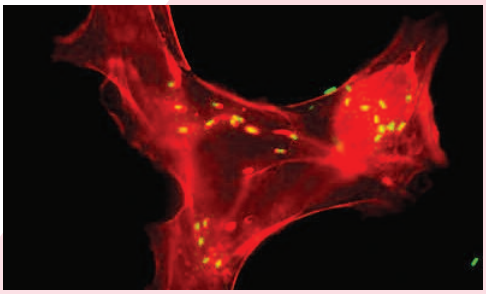
CREATING SPINAL DISC IMPLANTS AND ARTIFICIAL EARS / **Larry Bonassar, Biomedical Engineering, and Roger Härtl, Neurosurgery, Weill Cornell Medical College**, created an artificial implant to replace intervertebral discs in the spinal column. These biological implants will treat a range of degenerative disc diseases—a leading cause of disability worldwide.

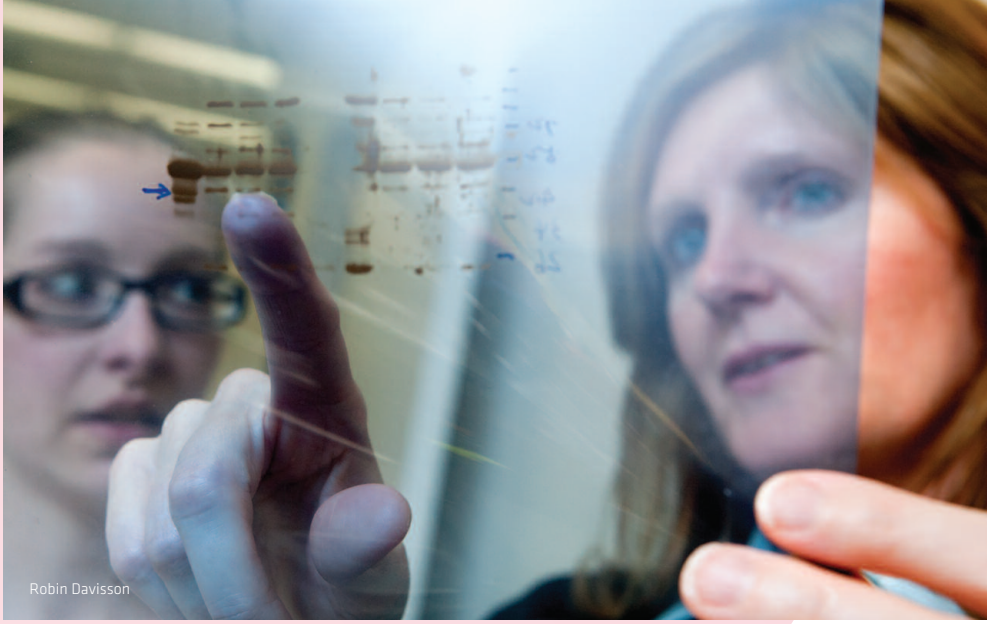
Later, the Bonassar lab, along with **Jason Spector, Surgery, Weill Cornell Medical College**, reported that they had created an artificial ear—using 3-D printing—that looks and acts like a natural ear. The development brings hope for children born with the congenital deformity microtia and individuals who have lost part or all of their external ear in an accident or from cancer.

CONTROLLING LISTERIA / **Kathryn J. Boor, Food Science/Dean, College of Agriculture and Life Sciences,** discovered a compound that is safe for mammals but kills *Listeria*. The compound, fluoro-phenyl-styrene-sulfonamide, interrupts a mechanism that controls genes expressed when the bacterium encounters a rapid change in its environment. The Boor lab set a new approach in the search for antibiotics that are not dangerous to mammals but stop pathogens like *Listeria*.

PHOTOS: LINDSAY FRANCE/CU, M. WIEDMANN AND M. ROMA, DAVISSON LAB

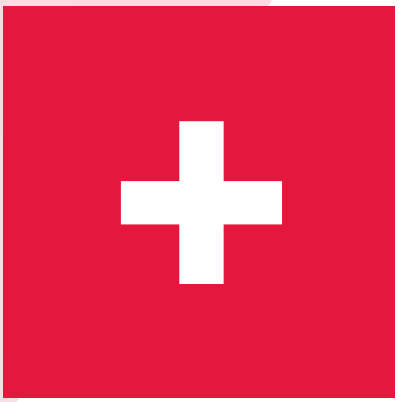
Listeria (green)



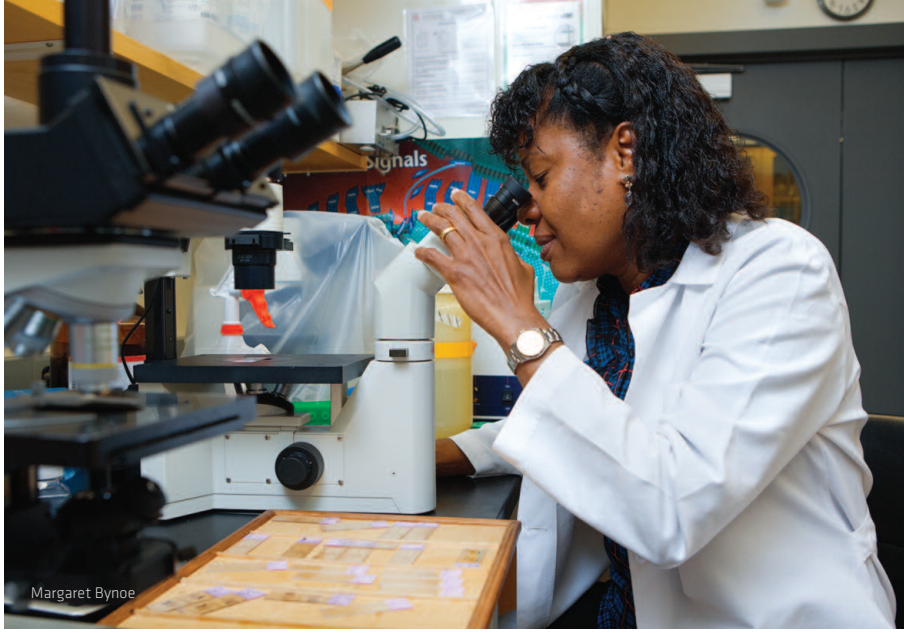


Robin Davisson

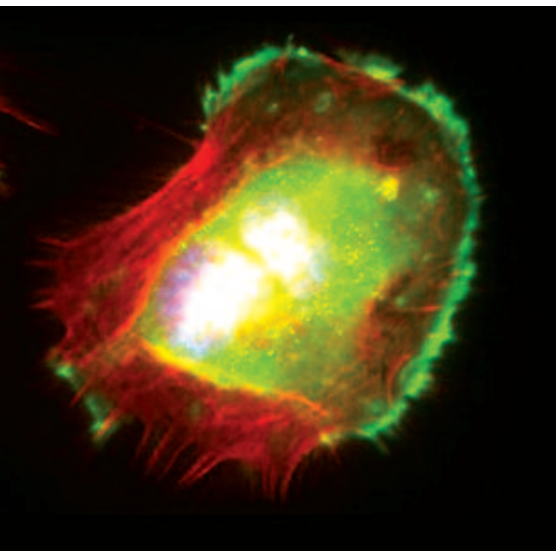
Larry Bonassar



Blood pressure is the measurement of force applied to artery walls. In hypertension, blood pressure is chronically too high, increasing risk for heart and kidney disease.



Margaret Bynoe



WHAT CANCER CELLS NEED TO TRAVEL

Richard A. Cerione, Molecular Medicine/ Chemistry and Chemical Biology, discovered what cancer cells need to travel as they invade new tissue. The Cerione lab identified two key proteins that cancer cells need in order to move and uncovered a new pathway that treatments could block, immobilizing mutant cells to keep cancer from spreading. Above is a migrating cervical cancer cell stained for tissue transglutaminase (green). Cells must gather this protein at their leading edge in order to move.

A KEY TO TREATING MULTIPLE SCLEROSIS / **Margaret S. Bynoe, Microbiology and Immunology,** discovered a receptor to control the movement of immune cells across central nervous system barriers (including the blood-brain barrier), which may hold the key to treating multiple sclerosis. The blood-brain barrier is composed of specialized cells that selectively prevent substances from passing from the bloodstream into the brain. The Bynoe lab revealed how an A2A adenosine receptor expressed on blood-brain barrier cells serves as a gateway, allowing immune cells to enter the brain.

TRACKING HYPERTENSION / **Robin L. Davisson, Biomedical Sciences/ Cell and Developmental Biology, Weill Cornell Medical College,** traced hypertension to a newfound cellular source in the brain, showing that treatments targeting this area can reverse the disease. The Davisson lab concluded that when the heart works too hard, the brain may be to blame, which is changing how scientists look at high blood pressure. This new paradigm for tackling the worldwide hypertension epidemic offers hope for billions of people with high blood pressure. Davisson was awarded the 2012 Arthur C. Corcoran Memorial Award from the American Heart Association for distinguished research in the field of hypertension.

TEENS' CHRONIC STRESS AND POVERTY / **Gary W. Evans, Human Development,** reported that childhood adversity is linked to chronic stress in adolescence, setting the stage for a host of physical and mental health problems. This longitudinal study from Evans' lab revealed that chronic stress in adolescence is linked to how much childhood time was spent in poverty.

SEARCHING FOR ALZHEIMER'S DISEASE THERAPIES / **Costantino Iadecola, Neurology and Neuroscience, Weill Cornell Medical College,** and his research colleagues discovered that amyloid peptides are harmful to the blood vessels that supply the brain with blood in Alzheimer's disease, accelerating cognitive decline by limiting oxygen-rich blood and nutrients.

PHOTOS: CERIONE LAB, JASON KOSKI/CU, PATRICIA KUHARIC, UNIVERSITY PHOTOGRAPHY

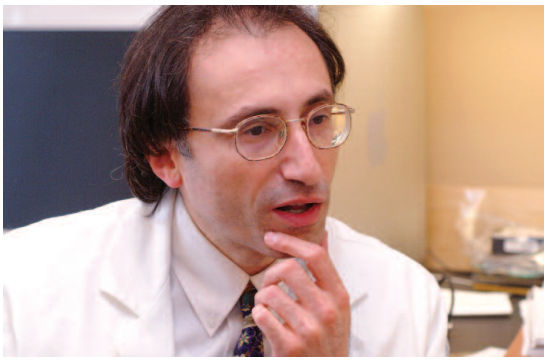
Iadecola says, "If we can stop the accumulation of amyloid in these blood vessels, we might be able to significantly improve cognitive function in Alzheimer's disease patients."

Corinna Loeckenhoff

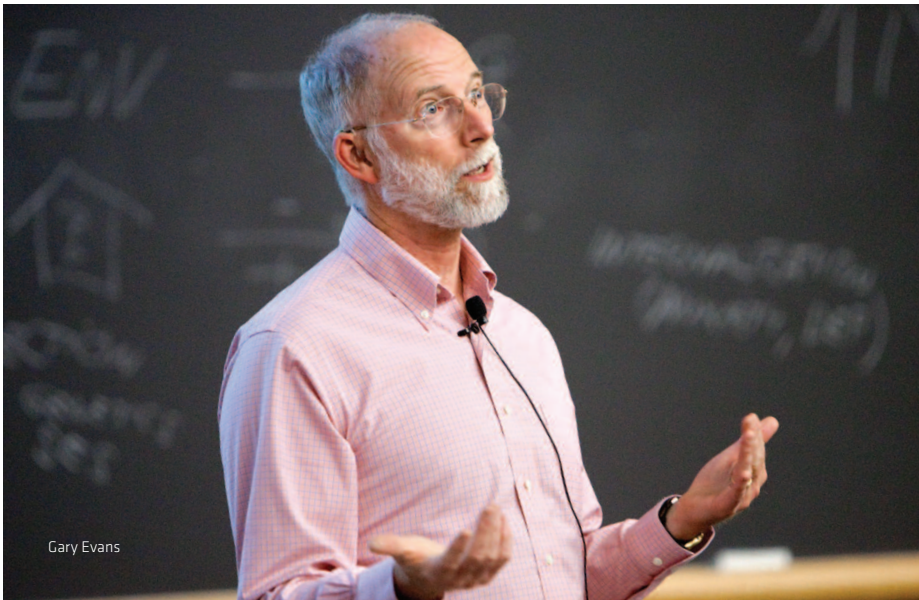
A BIOSENSOR FOR DISEASE DETECTION / **Amit Lal, Electrical and Computer Engineering,** invented a nanomechanical biosensor that could result in a quick, inexpensive, highly sensitive test that identifies disease markers and other molecules in low-concentration solutions for early stage disease detection. The Lal lab worked with the lab of **Dan Luo, Biological and Environmental Engineering,** to confirm the biosensor's operation.

PERSONALITY AND CAREGIVERS' HEALTH / **Corinna Loeckenhoff, Human Development,** and research colleagues reported—in one of the first studies to look at the influence of care-receiver personality on caregiver health—that people who cared for individuals who are "easygoing" and "well-intentioned" reported better physical health than those who cared for headstrong and less agreeable people. In another study, Loeckenhoff and research colleagues discovered that certain personality traits of caregivers, like extroversion, reduced risks of caregivers' mental and physical health problems.

DAMAGED BLOOD VESSELS REGENERATED / **Shahin Rafii, Medicine/ Ansary Stem Cell Institute,** and research colleagues discovered a way to utilize diagnostic prenatal amniocentesis cells, reprogramming them into abundant and stable endothelial cells capable of regenerating damaged blood vessels in heart disease, stroke, diabetes, and trauma and repairing injured organs. Rafii says, "Currently, there is no curative treatment available for patients with vascular diseases, and the common denominator to all these disorders is dysfunction of blood vessels, specifically endothelial cells that are the building blocks of the vessels." A patent has been filed on the discovery.



Shahin Rafii



Gary Evans

Brian Wansink

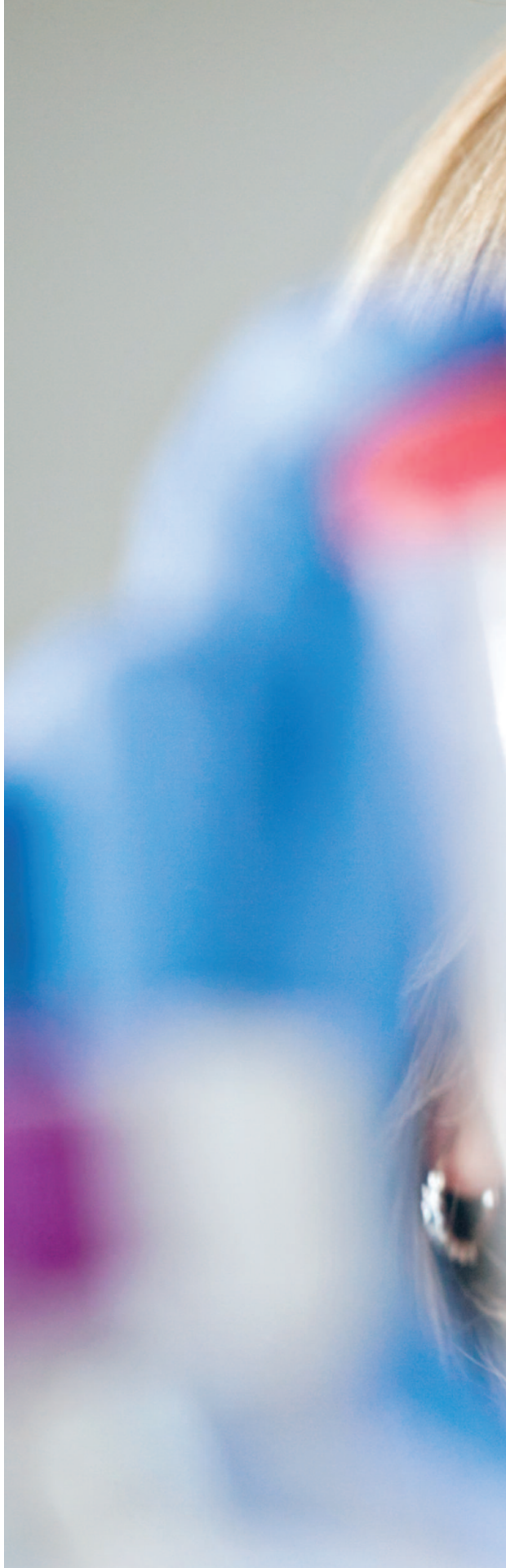
LINKING DIABETES AND INFLAMMATION / **Ling Qi, Nutritional Sciences,** says, "When tissue is inflamed, it becomes insulin resistant." His lab discovered that a type of immune cell called natural killer T cells is an important part of the longstanding puzzle of how obesity, type 2 diabetes, and low-level inflammation are linked. A patent was filed as a result of the study. Qi also won an American Diabetes Association Career Development Award—a $912,500 prize given to junior faculty members who have made significant contributions to diabetes research.

A MISSING GENE IN BREAST CANCERS / **John C. Schimenti, Biomedical Sciences/Molecular Biology and Genetics,** found that 28 percent of breast cancers lack a certain gene called NF1. This gene deletion plays a role in 60,000 breast cancer patients in the United States and 383,000 worldwide. The finding suggests that several existing drugs may be effective in treating breast cancers with missing NF1.

WHAT KIDS WANT ON THEIR PLATES / **Brian C. Wansink, Applied Economics and Management,** found that kids like food plates with seven different items and six different colors, which is different from their parents' preference for three items and three colors. The research implies new ways of encouraging more nutritionally diverse diets. The Wansink lab shows how to change broccoli and fish, for example, so that they look tastier to children.

LIVING TISSUE IN 3-D / **Chris Chunhui Xu, Applied and Engineering Physics,** and research colleagues demonstrated a new imaging technique that delivers high-speed 3-D images in living tissue. Scientists trying to decipher the microenvironment of living biological tissues now have a way of imaging their inner workings. Taking high-resolution, 3-D images of the subcortical region of a live intact mouse's brain, Xu and colleagues demonstrated three-photon microscopy with a threefold improvement in depth limits over Cornell-invented multiphoton microscopy.

PHOTOS: FRANK DIMEO, LINDSAY FRANCE/CU



PREVENTING ATHEROSCLEROSIS

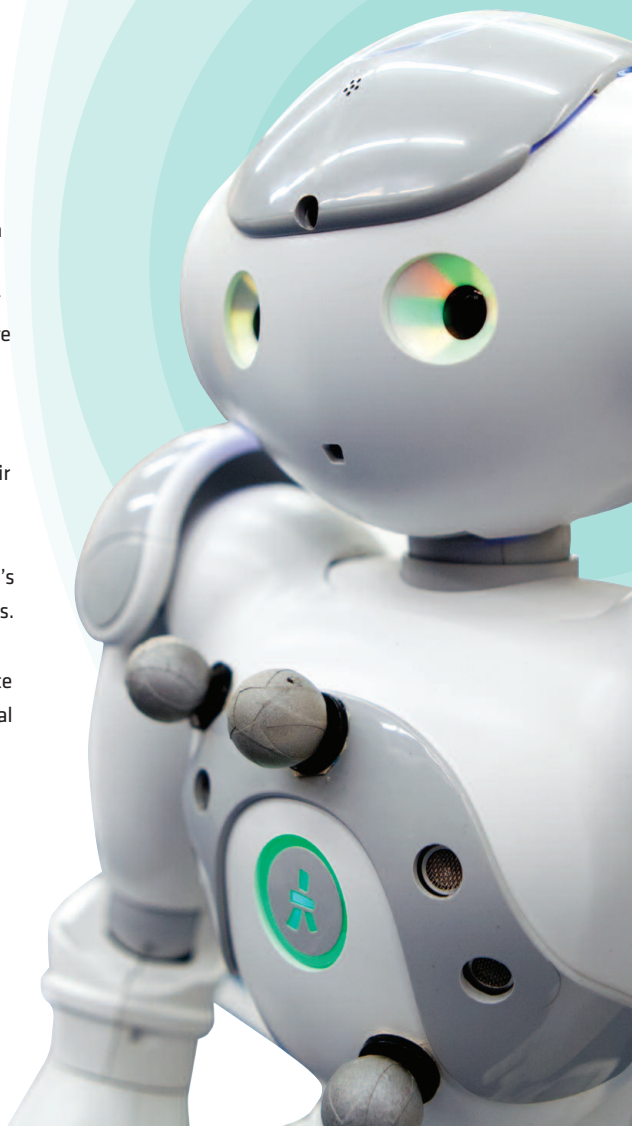
Cynthia A. Reinhart-King, Biomedical Engineering, and research colleagues found a clue to the underlying causes of atherosclerosis that relates to how the cells lining the blood vessels, endothelial cells, behave as the vessels stiffen with age. This insight could lead to more targeted drug therapies to prevent the disease.

ALL THINGS WEB, ROBOTICS & ANIMATION

Cornell's extremely talented computer scientists are making our world more productive, progressive, user-friendly, fun, and secure. They produce a broad, important body of work—research and marketable technology—and occupy a distinctive place at the top of the field.

DO YOU BELIEVE ONLINE REVIEWS? / **Claire T. Cardie, Computer Science/Information Science, and Jeffrey T. Hancock, Communication/ Information Science,** know that there is a lot of deception online, and they have been developing computer software to identify deceptive reviews. In a test on 800 reviews of Chicago hotels, a computer was able to pick out deceptive reviews with almost 90 percent accuracy. Cardie, Hancock, and their teams also discovered an intriguing correlation between the linguistic structure of deceptive reviews and fiction writing.

"NEVER SEND A HUMAN TO DO A MACHINE'S JOB." / **Jon M. Kleinberg and Lillian J. Lee, Computer Science/Information Science,** and their graduate students showed how phrasing affects memorability–linguistic features that make a statement stand out–by comparing lines from movie scripts. Whether it's a line from a movie, an advertising slogan, or a politician's catchphrase, some statements take hold in people's minds better than others. Applying computer analysis to a database of movie scripts, the team found clues to what makes a line memorable: memorable lines use familiar sentence structure but incorporate distinctive words or phrases, and they make general statements that could apply elsewhere.



PHOTOS: LINDSAY FRANCE/CU

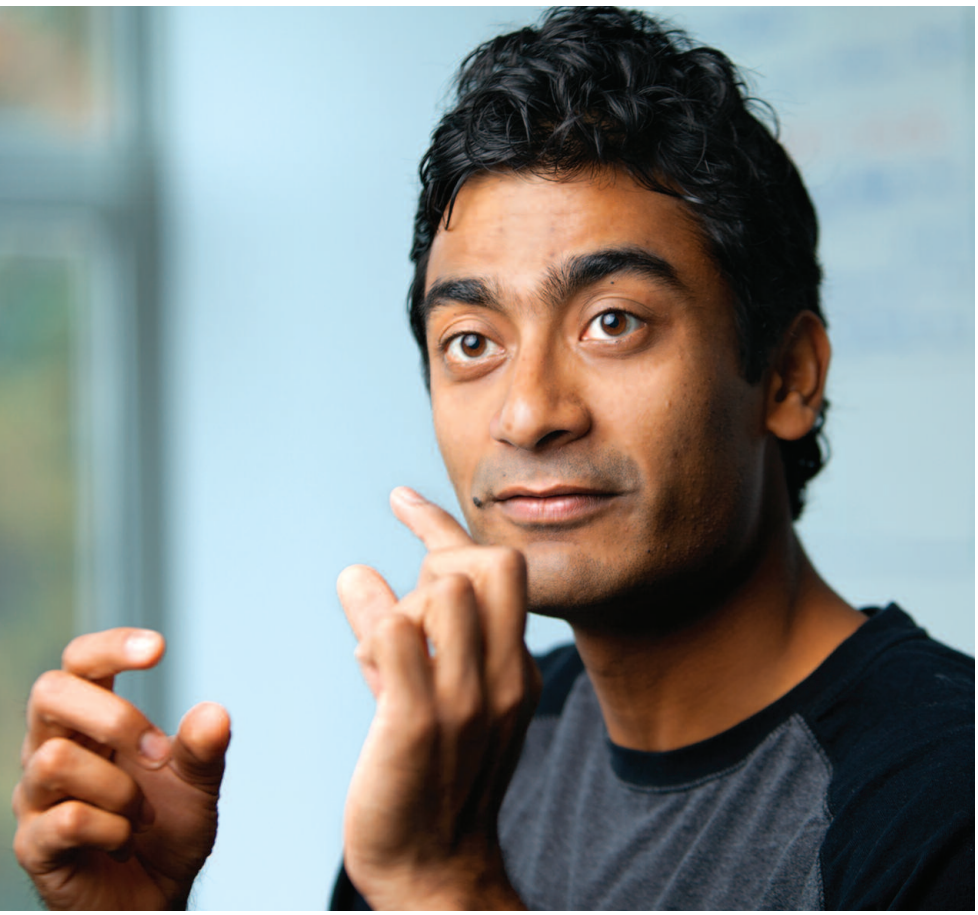
Michael Macy (l.) with colleagues Douglas Heckathorn (m.) and Victor Nee (r.)

Jon Kleinberg

Rafael Pass

Claire Cardie

Hod Lipson

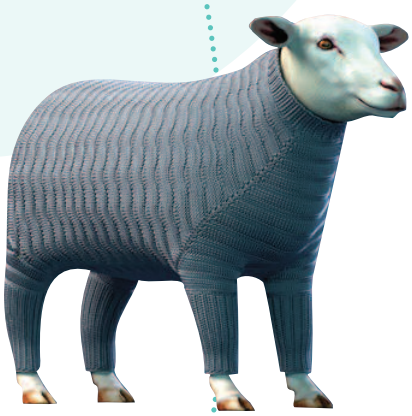


Ashutosh Saxena

THE MAID IS A ROBOT

Ashutosh Saxena, Computer Science, and his lab trained a robot to tidy up. The robot can identify objects, pick them up, and put them away. The Saxena lab then added the human element, teaching robots to "hallucinate" where and how humans might stand, sit, or work in a room, so that they can place objects in their usual relationship to the imaginary people.

PHOTOS: ROBERT BARKER/CU, FRANK DIMEO, LINDSAY FRANCE/CU, CU, UNIVERSITY PHOTOGRAPHY



LEARNING TO GRIP **Hod Lipson, Mechanical and Aerospace Engineering/ Computing and Information Science, and Ashutosh Saxena, Computer Science,** created a hand for an autonomous robot. These labs developed an algorithm that allows a robot to learn grasping skills from experience and apply them in new situations. Inspired by the universal jamming gripper created earlier in the Lipson lab, the new hand will work with any type of robot gripper.

MOOD RHYTHMS **Michael W. Macy, Sociology/Information Science,** and his graduate student studied the tweets of 2.4 million people in 84 countries. After an analysis of these public Twitter messages, they found that a day begins on a high, but moods go downhill over the course of a day, only to rebound in the evening. They discovered peaks in positive tweets in the early morning and late at night, on weekdays as well as weekends, across cultures.

IS IT OR ISN'T IT ANIMATED? **Douglas L. James and Stephen R. Marschner, Computer Science,** and their colleagues are achieving the details of animation that will make everything so real we won't know if it's real or not. That sense of reality requires dressing computer-generated characters in realistic clothing and simulating clothing sounds. They created a method for building simulated knitted fabric out of an array of individual stitches—basically teaching the computer to knit. They also created a method of synthesizing cloth sounds to simulate the rustling of clothing as the characters move.

CAN'T ALTER THIS MESSAGE **Rafael N. Pass, Computer Science,** and his lab developed a new way to send, over a computer network, a message that cannot be altered by a third party—thwarting the man-in-the-middle attack. This is a classic problem in computer security. Instead of the thousands of communication rounds or sender-receiver prearranged plans, the new protocol works with 15 communication rounds or less and does not require a trusted infrastructure set up in advance.

IMAGINATIVE SCHOLARSHIP AND CREATIVITY

Fresh takes on humanity-serving scholarship and creativity have always been a trademark of Cornell research. Cornell's scholars—a faculty of visionaries—delve into fascinating mores and values as they emerge in our society. They bring us new perspectives on the past. They are driven to teach, learn, and satisfy curiosity, creating a body of scholarship that enriches our lives in ways unexpected.

GENES AFFECT POLITICAL AND ECONOMIC PREFERENCES

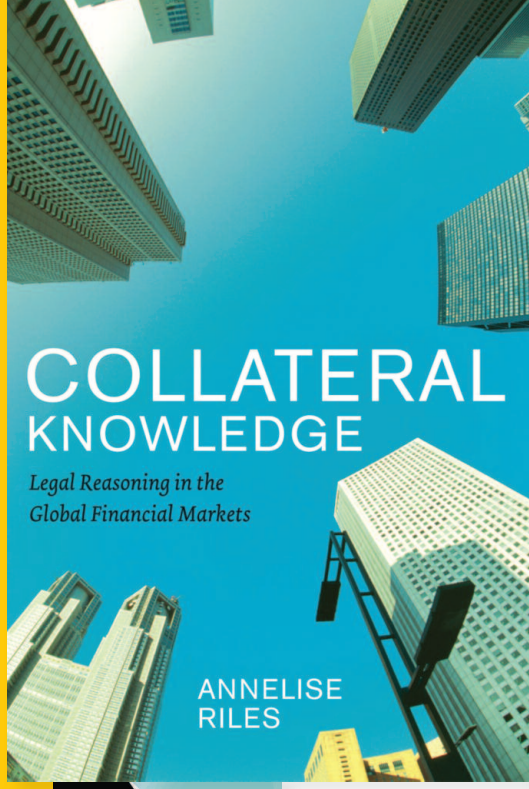
Daniel Benjamin, Economics, led a research team that studied 3,000 people with comprehensive genetic data and information on economic and political preferences. They reported that unrelated people who are more similar genetically tend to have more similar attitudes and preferences. The findings suggest that genetic data, taken as a whole, could eventually help predict economic and political preferences.

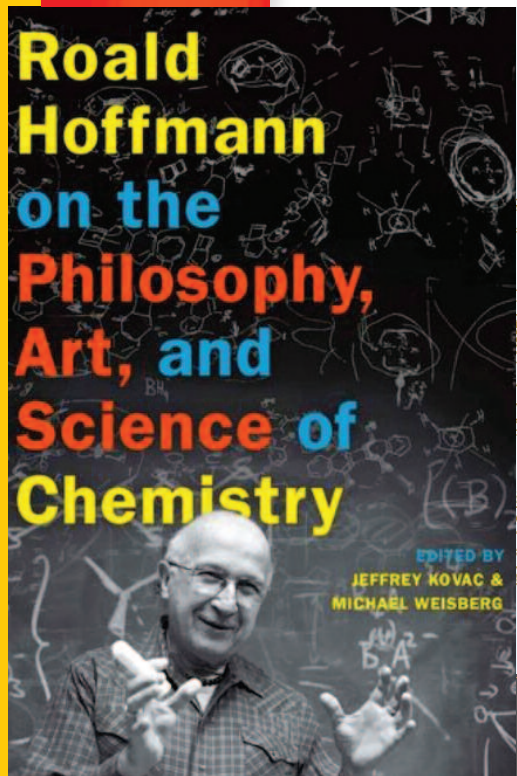
CORNELL'S COLLABORATIVE DECISION-MAKING RESEARCH

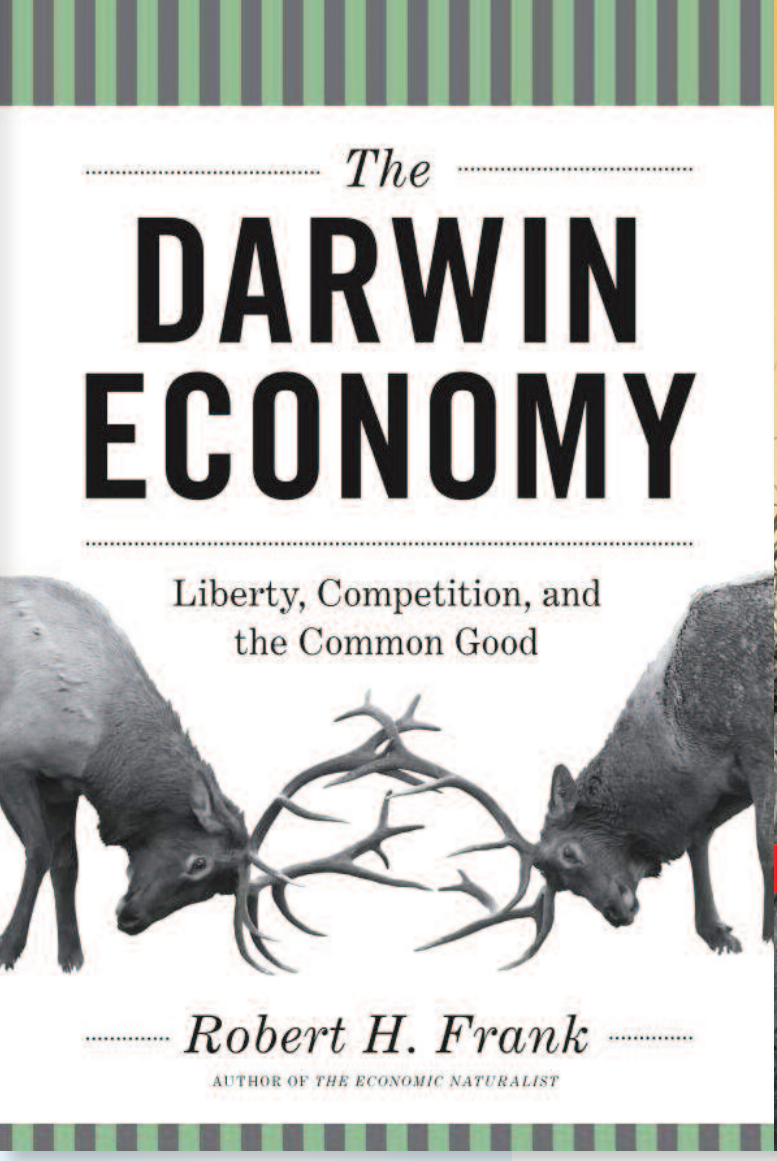
The Institute for the Social Sciences' 2009–2012 theme project—Judgment, Decision Making, and Social Behavior—resulted in 85 scholarly publications spanning economics, psychology, government, law, policy analysis and management, human development, and business, generated by 12 Cornell faculty members. Sharing office space and meeting weekly, this group of experts significantly advanced research on decision making. Two major national conferences, public lectures with visiting scholars, and Cornell workshops and seminars were also important outcomes.

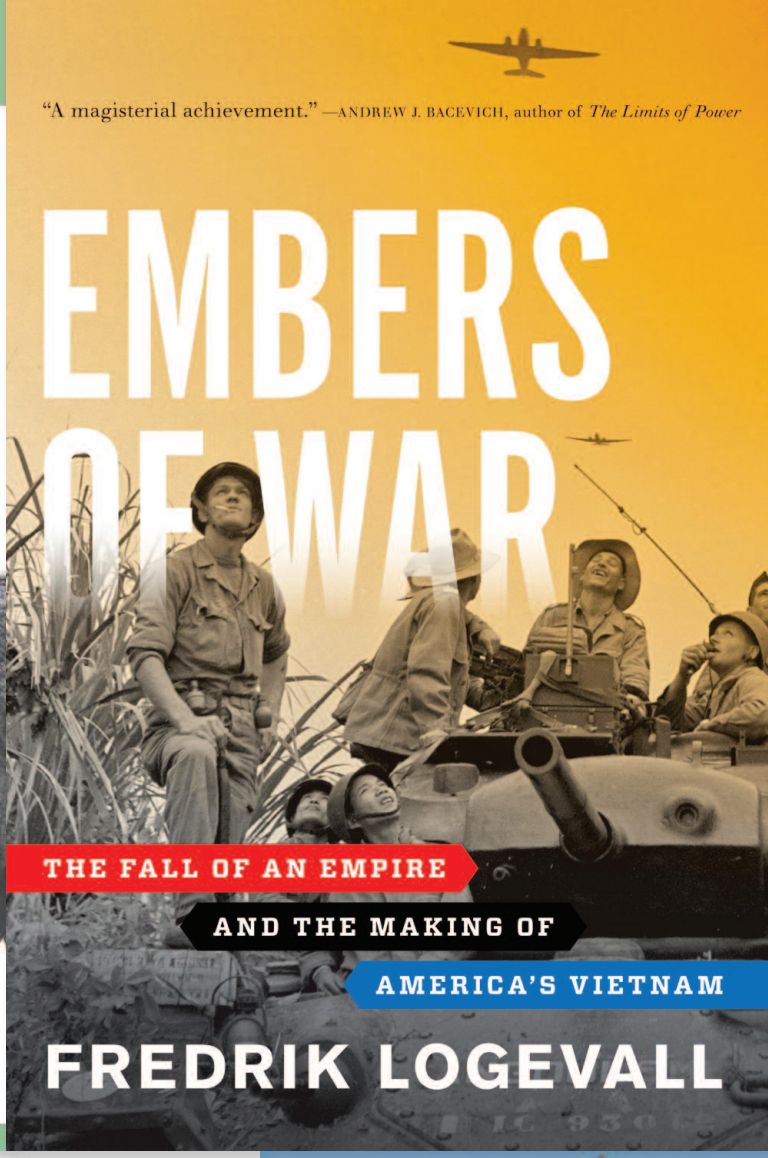
ROBERT BARKER/CU

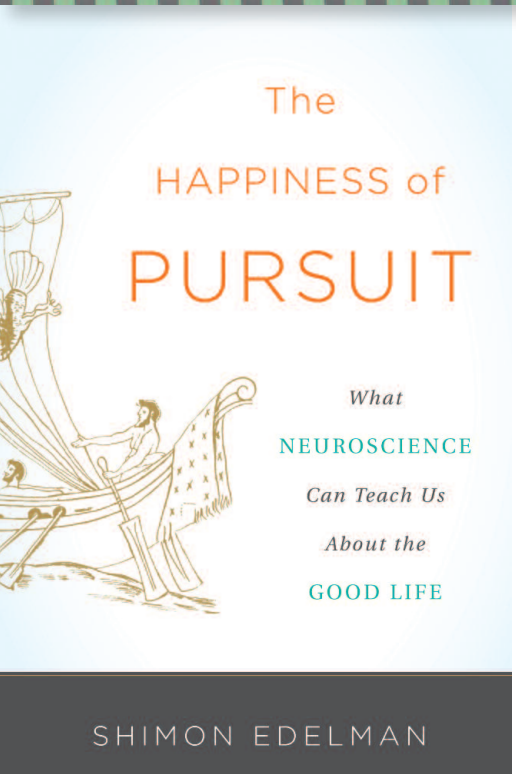
The team, from left, Ori Heffetz, Valerie Hans, Peter Enns, David Dunning, Emily Owens, Ted O'Donoghue, and Daniel Benjamin. Seated from left, Jeffrey Rachlinski, Benjamin Ho, Valerie Reyna, Robert Frank, and Vivian Zayas.

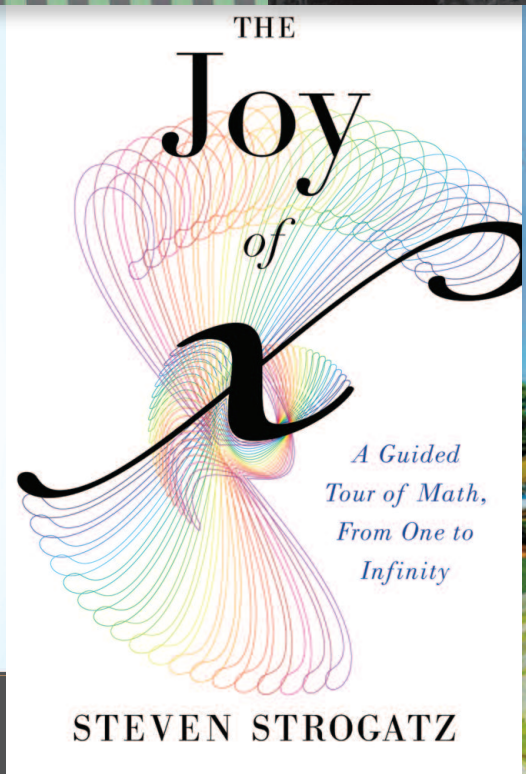


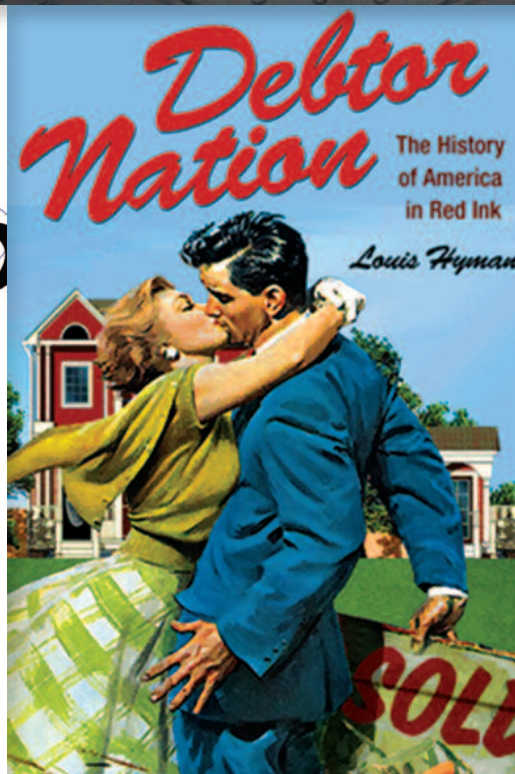



The
DARWIN ECONOMY
Liberty, Competition, and the Common Good
Robert H. Frank
AUTHOR OF THE ECONOMIC NATURALIST


"A magisterial achievement." —ANDREW J. BACEVICH, author of The Limits of Power
EMBERS OF WAR
THE FALL OF AN EMPIRE
AND THE MAKING OF
AMERICA'S VIETNAM
FREDRIK LOGEVALL

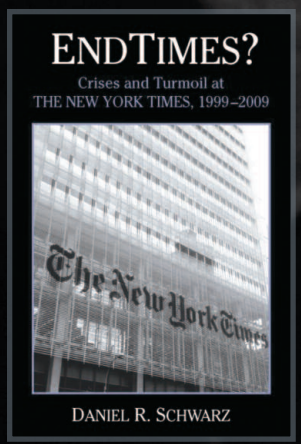

The
HAPPINESS of
PURSUIT
What
NEUROSCIENCE
Can Teach Us
About the
GOOD LIFE
SHIMON EDELMAN


THE
Joy
of
x
A Guided Tour of Math, From One to Infinity
STEVEN STROGATZ


Debtor Nation
The History of America in Red Ink
Louis Hyman

TRYING TIMES

Daniel R. Schwarz, English, who says he has had "a lifelong love affair with *The New York Times*," takes an in-depth look at the newspaper during 10 difficult years in his book *Endtimes? Crises and Turmoil at The New York Times, 1999–2009* (State University of New York Press, 2012). Schwarz discusses the contemporary newspaper, from columnists to cultural coverage. He examines how the paper has responded to constant updating in broadcast and online news by providing increased analysis—as opposed to reporting—of the news, including features on health, investing, and travel.



ABOUT COLLECTING / **Jeremy Braddock, English,** gives a fresh perspective on the making of modernism in his book *Collecting as Modernist Practice* (Johns Hopkins University Press, 2012). He explores the importance of art collections, anthologies, and archives as collective forms of modernist expression in the United States.

BRANDING, A GAME CHANGER / **Chekitan S. Dev, Hotel Administration,** describes how the hospitality industry has gone from a traditional operations-centric business model to a brand-centric model in his book *Hospitality Branding* (Cornell University Press, 2012). He blends recent history and cutting-edge research, offering hospitality organizations advice on how to survive and thrive in today's competitive global business environment. Creating and building great brands has become the primary purpose of the business, with the pre-eminence of a brand driving the never-ending quest for market share. Dev says, "Not only has brand become the chief means of attracting customers, it has, more broadly, become the chief organizing principle for most hospitality organizations."

REMEMBERING THE FUTURE / **Shimon Y. Edelman, Psychology,** perceives a sense of happiness as something to be pursued, rather than captured, inspiring his book *The Happiness of Pursuit: What Neuroscience Can Teach Us About the Good Life* (Basic Books, 2012). Edelman poses the question: Why do we grow restless once we've attained a peak? He says evolution favors creatures that can see a bit into the future, so it's in our nature to look and think ahead. We make predictions based on past performance, patterns, and trends that allow us to look into the future and chase satisfaction.

DARWIN, AN ECONOMIST? / **Robert H. Frank, Johnson Graduate School of Management,** argues that economies are not driven by supply and demand, but rather survival of the fittest, in his book *The Darwin Economy: Liberty, Competition, and the Common Good* (Princeton University Press, 2011). Frank says that Darwin understood the true nature of competition better than Adam Smith, the intellectual father of economics. Although Frank agrees that unbridled competition often promotes the common good, as Smith claimed, he argues, "Charles Darwin understood how individual interests conflict sharply with group interests, and in those cases, individual interests tend to prevail."

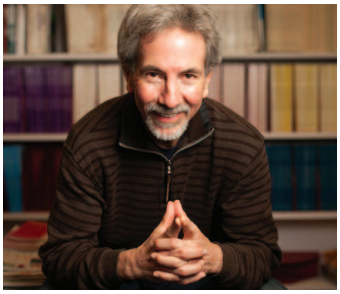
"WE'LL ALWAYS HAVE PARIS." / **Thomas D. Gilovich, Psychology,** revealed in earlier research that buying experiences gives us more happiness than buying material things. Now his research team has revealed why telling stories makes us enjoy the experiences even more. We talk about our experiences more than our purchases, so telling stories furthers our enjoyment.

Shimon Edelman

Jeremy Braddock

PHOTOS: JASON KOSKI/CU, CU, UNIVERSITY PHOTOGRAPHY

Thomas Gilovich



Roald Hoffmann

Jenny Sabin

A CHEMIST'S ART AND SCIENCE

Nobel Laureate Roald Hoffmann, Chemistry and Chemical Biology, writes on a variety of topics, including chemistry, writing, art, science, and education. Twenty-eight of his essays have been collected in a new book, *Roald Hoffmann on the Philosophy, Art, and Science of Chemistry* (Oxford University Press, 2012). The book represents Hoffmann's unique understanding of chemistry and its broader contexts in philosophy, literature, and the arts.

AMERICA IN RED INK / **Louis R. Hyman, Industrial and Labor Relations,** wrote the first book to follow the history of personal debt in *Debtor Nation: The History of America in Red Ink* (Princeton University Press, 2011). Hyman traces the evolution of debt over the course of the 20th century, following its transformation from fringe to mainstream, thanks to federal policy, financial innovation, and retail competition.

VIETNAM DEFINITIVELY CHRONICLED / **Fredrik Logevall, History,** traces the path of France and the United States in Vietnam, delving deeply into the historical record to answer unresolved questions about the demise of one Western power in Vietnam and the arrival of another, in his book *Embers of War: The Fall of an Empire and the Making of America's Vietnam* (Random House, 2012). The book brings events and personalities to life in a dramatic account. Logevall won the 2013 Pulitzer Prize for History for the book.

GLOBAL FINANCIAL MARKETS / **Annelise Riles, Law,** explores the legal infrastructure underlying global financial markets in her book *Collateral Knowledge: Legal Reasoning in the Global Financial Markets* (University of Chicago Press, 2011). Who are the agents of financial regulation? Is good or bad financial governance the work of legislators and regulators? Riles asserts that financial governance is accomplished not only through top-down laws

PHOTOS: JASON KOSKI/CU, LINDSAY FRANCE/CU, ROBYN WISHNA/CU, CU

Steven Strogatz

and policies, but also in the daily use of mundane legal techniques such as collateral by secondary agents, including legal technicians, retail investors, financiers, academics, and even computerized trading programs. Although collateral may keep a low profile, its activities should not be ignored as we think about how markets should work and be governed.

KNITTING, BRAIDING, AND WEAVING BUILDINGS / **Jenny E. Sabin, Architecture,** designed a textile pavilion for Nike in New York City using photoluminescent, solar-active and reflective threads, inspired by the company's new footwear. Commissioned as part of Nike's Flyknit collection—featuring a new technology that uses machine-knitted fabric and eliminates many toxic glues from the manufacturing process—the project gave Sabin an opportunity to probe "how the simplicity of knitting is coupled with the dynamics and complexity of the human body." Sabin wondered, "Could we knit, braid, and weave buildings?" Her project demonstrated the potential of soft textile-based architecture.

THE JOY OF MATH / **Steven H. Strogatz, Mathematics/Mechanical and Aerospace Engineering,** explains some of the most elegant ideas in math and shows math's surprising connections to our daily lives in his book *The Joy of x: A Guided Tour of Math, from One to Infinity* (Houghton Mifflin Harcourt, 2012). Ponder these connections, for example: How many people should we date before settling down? How does Google search the internet?

Annelise Riles

Fredrik Logevall

OUR PHYSICAL WORLD

Cornell's groundbreaking basic and applied research—resulting in innovations in advanced materials, energy, and environment-friendly and other super products—has been a longtime global force. This Cornell research addresses societal needs and advances the economy, and it delivers results that truly matter.

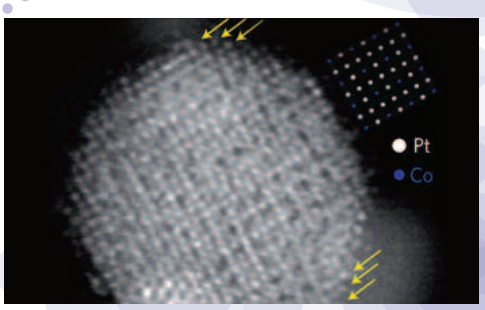
BOOSTING FUEL CELL OUTPUT AT LOWER COSTS / **Héctor Abruña and Francis DiSalvo, Chemistry and Chemical Biology, and David Muller, Applied and Engineering Physics,** scored a significant advance with a chemical process for improving fuel cell output and cost. The process creates platinum-cobalt nanoparticles with a platinum-enriched shell that shows improved catalytic activity. Abruña says, "It enhances the catalysis and cuts the cost by a factor of five."

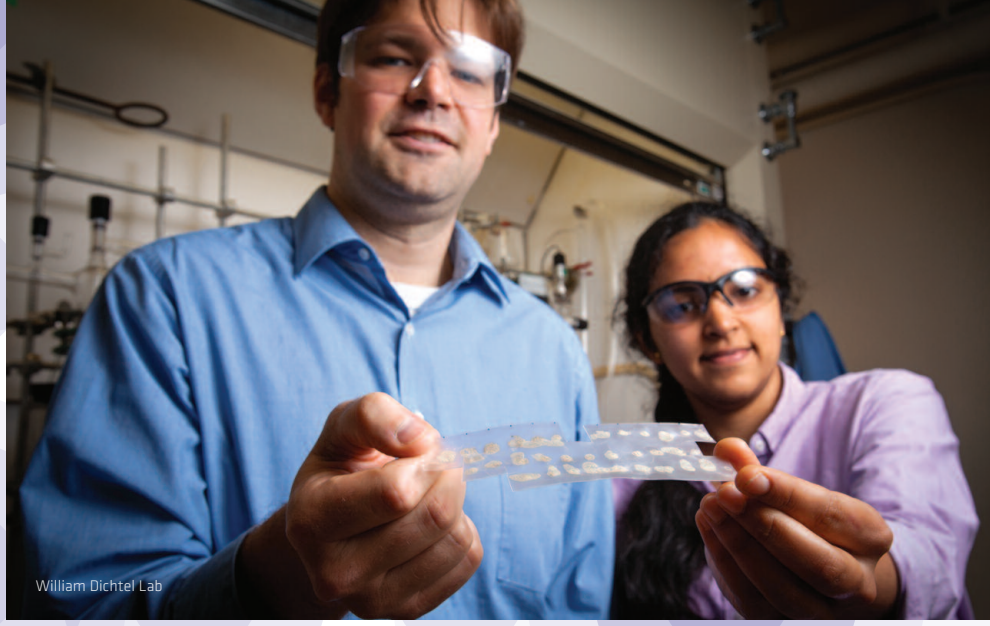
CHESS COLLABORATIONS / **Cornell High Energy Synchrotron Source** helped scientists progress in designing the perfect organic semiconductor by spatially mapping the microstructure, texture, grain sizes, and grain orientations of organic semiconductor thin films. The films hold promise for low-cost, flexible electronics–for example, plastic electronics in which an organic material replaces silicon. CHESS's imaging capabilities also helped other colleagues develop enhanced light-emitting diode displays, which could markedly improve LED displays for LED television and computer screens.

TO DETECT EXPLOSIVES / **William R. Dichtel, Chemistry and Chemical Biology,** and his team created a new polymer that can quickly and safely detect a key ingredient in improvised explosive devices. The polymer could be used in low-cost handheld explosive detectors.

PHOTOS: ROBERT BARKER/CU, FRANK DIMEO, LINDSAY FRANCE/CU, JASON KOSKI/CU, CU; *ADVANCED MATERIALS*

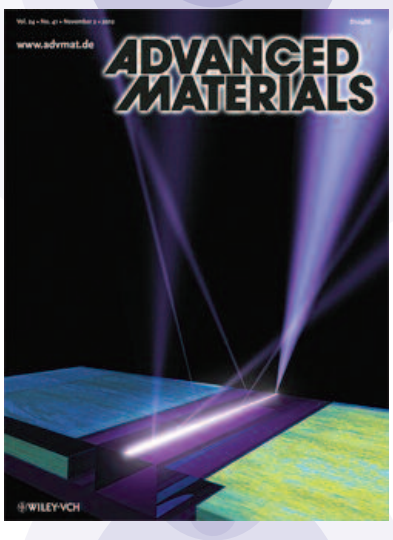
Electron microscope image of a platinum-cobalt alloy nanoparticle, showing the arrangement of the metal atoms into an ordered lattice (for PtCoparticle)





William Dichtel Lab

Richard Robinson



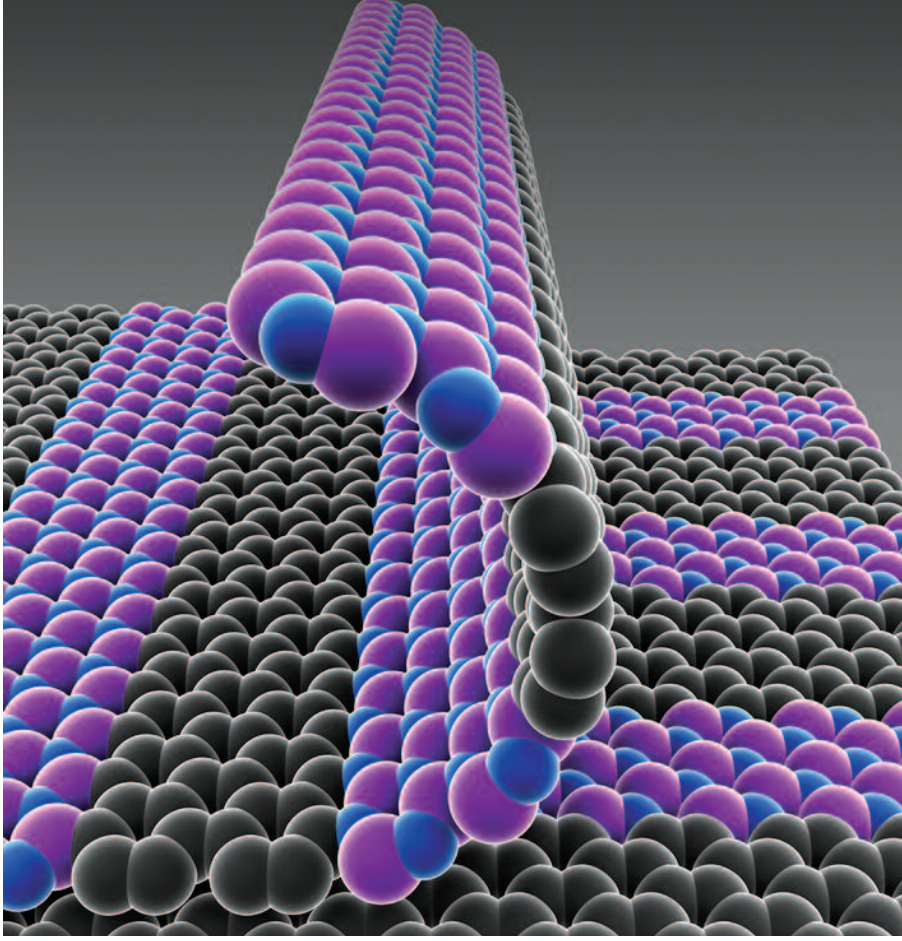
Héctor Abruña

SYNCHRONIZED BY LIGHT

Michal Lipson, Electrical and Computer Engineering, and Paul McEuen, Physics, and their labs demonstrated synchronization at the nanoscale, using light, not mechanics. They showed that two nanomechanical oscillators, suspended only nanometers apart, can talk to each other and synchronize by means of nothing more than light. The researchers demonstrated switching this coupling on and off, as well as tuning the oscillators' frequencies. The technique has implications for new nanoscale photonic capabilities, such as in tuning oscillator networks for sensing, signal processing, and nanoscale integrated circuits.

JASON KOSKI/CU

Jiwoong Park



SUPER GRAPHENE

Jiwoong Park, Chemistry and Chemical Biology, and David A. Muller, Applied and Engineering Physics, and their labs used advanced measurement and imaging techniques to show how the stitching between individual crystals of graphene affects how well these carbon monolayers conduct electricity and retain their strength. They found that tighter stitching between grains makes better graphene: more reactive, quick-growth graphene with more small patches, as opposed to slower growth graphene with larger patches.

Park and his colleagues also invented a way to pattern single-atom films of graphene and boron nitride, an insulator, without using a silicon substrate. Integrated circuits—in everything from coffeemakers to computers—are patterned from very thin crystalline silicon. By choosing graphene, Park is pushing thin-film boundaries to the single-atom level, which could lead to the first atomically thin integrated circuit.

CLOAKING: A GAP IN A BEAM OF LIGHT / **Alexander Gaeta, Applied and Engineering Physics,** and his lab demonstrated cloaking on a very small scale in the transport of information by a beam of light. They did it by creating a gap in the beam of light, having the hidden event occur as the gap goes by, then stitching the beam back together. Gaeta's team calls it a time lens. They can manipulate and focus signals in time, analogous to the way a glass lens focuses light in space. Their technique could improve fiber-optic data transmission and data processing, allowing users to insert an emergency signal without interrupting the main data stream, for example.

IMPROVING BATTERY PERFORMANCE, PLUS / **Richard Robinson, Materials Science and Engineering,** developed a method, using nanoparticles, to make additive-free battery electrodes that maintain high conductivity, opening new possibilities for reducing the weight and volume of batteries, while also creating a template system for studying the physics of nanoparticle electrodes.

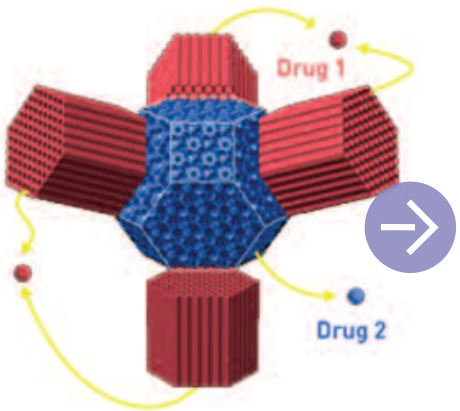
During another project, the group also developed an inexpensive, environmentally friendly way of synthesizing oxide crystal sheets, only nanometers thick, which have useful properties for electronics and alternative energy applications.

PHOTOS: ROBERT BARKER/CU, LINDSAY FRANCE/CU, MULLER LAB, WIESNER LAB

Robinson Lab

James Sethna

NEW POWER LAW OF CRACKLES / **James Sethna, Physics,** and research colleagues reported that the crackling behavior of materials under slowly increasing stress, like crumpling pieces of paper—physicists call them avalanches—may have a previously unknown characteristic. The Sethna lab used both theory and experiment to describe this never-before-seen oscillatory behavior of microcrystal plastic bursts at very small scales. Their discovery materialized as a new power law that determines the probability of crackles of different sizes—a theory that could apply to many intermittent phenomena that become oscillatory as relaxation increases, such as earthquakes deep in the Earth's crust or the low-frequency oscillations of brain waves during sleep.



The core lattice in blue illustrates where drugs can be placed in compartment pores for targeting in the body. In the hexagon-shaped cylinder branches, other types of drugs may be placed for delivery. Simultaneous delivery of pharmaceuticals can thus be optimized for each drug separately.

CREATING METAL NANOSTRUCTURES / **Ulrich Wiesner, Materials Science and Engineering,** and his lab developed a technique of making porous metal films with up to a thousand times the electrical conductivity of previous methods. Their technique—the result of several years of experimentation—may lead to creating a wide variety of metal nanostructures for engineering and biomedical applications, including porous metal films for catalysts in fuel cells and electrodes in batteries.

Wiesner's team and other researchers from Cornell and Memorial Sloan Kettering Cancer Center also created porous nanoparticles with separate compartments that could carry two or more different drugs to the same location, with precise control over the amounts. The technology might also be applied to catalysts used to enhance chemical reactions, allowing two or more catalysts to work in sequence.

SELECTED NOTABLES
FUNDING

EXCELLENCE IN CANCER RESEARCH / Lewis C. Cantley, Medicine/Director of the Cancer Center at Weill Cornell Medical College, was a winner of the inaugural Breakthrough Prize in Life Sciences. The prize, which carries a $3 million cash award and is the largest academic prize for medicine and biology, recognizes excellence in research aimed at curing intractable diseases and extending human lives.

CORNELL'S COLLABORATIVE HUMANITIES / The Andrew W. Mellon Foundation awarded $1.4 million to support a Cornell pilot program in architecture, urbanism, and the humanities, covering six semesters of seminars from spring 2014 through fall 2016.

SMART ELECTRICAL GRID / Lang Tong, Electrical and Computer Engineering, received a four-year, $1.9 million award from NSF to lead a multidisciplinary team of researchers from Cornell, Georgia State University, and University of California, Berkeley, to study the U.S. smart grid. The team aims to develop a system for computation and information sharing in a smart electrical grid.

NEXT-GEN NANOSCALE ELECTRONICS / Craig J. Fennie, Applied and Engineering Physics; Ephrahim Garcia, Mechanical and Aerospace Engineering; and Darrell Schlom, Materials Science and Engineering, are part of a new $35 million NSF Engineering Research Center to create highly efficient, powerful electromagnetic systems no larger than biological cells. The center, Translational Applications of Nanoscale Multiferroic Systems, is housed at University of California, Los Angeles, but draws expertise from five academic institutions.

AT THE INTERSECTION OF MATERIALS SCIENCE AND ELECTRICAL ENGINEERING / Kionix Inc., an Ithaca-based company that commercializes technology developed at Cornell, awarded a $1 million gift to Cornell's College of Engineering to establish the Kionix Graduate Fellowship in Engineering.

BIOFUELS / David Erickson, Mechanical and Aerospace Engineering, and Largus Angenent, Biological and Environmental Engineering, received a $910,000 grant from the U.S. Department of Energy to help revolutionize how biofuels are produced from algae.

GRAND CHALLENGES EXPLORATIONS / Three labs at Weill Cornell Medical College—led by Carl Nathan, Medicine/Microbiology and Immunology; Kyu Rhee, Medicine/ Microbiology and Immunology; and Laurie H. Glimcher, Medicine—were awarded research grants totaling $1.5 million by the Bill and Melinda Gates Foundation Grand Challenges Explorations initiative. The labs study innovative approaches to diseases such as tuberculosis and HIV.

ENDOWING THE HUMANITIES / Cornell's Society for the Humanities received an Andrew W. Mellon Foundation grant of $1.3 million—$330,000 to continue initiatives in the short term and $1 million contingent on Cornell raising an additional $2 million to support a permanent endowment for the Society for the Humanities programs.

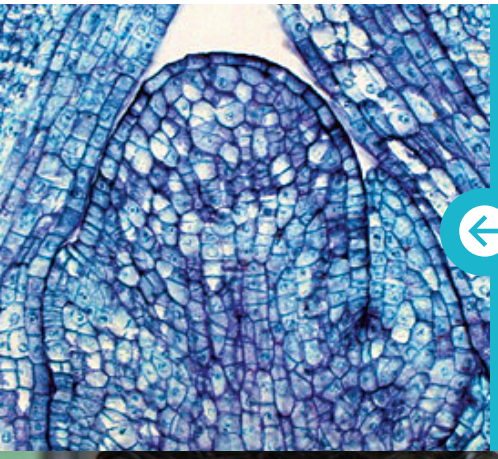
INTERDISCIPLINARY GOES HIGH-RISK, HIGH-REWARD / Three Cornell research teams received support from the Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE) program for high-risk, high-reward interdisciplinary research.

Mukund Vengalattore, Physics, and Sunil A. Bhave, Electrical and Computer Engineering, received $800,000 over four years to develop a novel optomechanical system that works with atomic-level sensitivity.

Lang Tong, Electrical and Computer Engineering, and Shanjun Li, Applied Economics and Management, received a four-year, $700,000 grant to study the engineering and economic challenges of a sustainable pathway to an electric vehicle–based transportation system.

Jiangang Dai, Operations Research and Information Engineering, is a principal investigator with colleagues at University of California, San Diego and Georgia Institute of Technology on a three-year, $750,000 project to deliver an analytical framework for solving emerging networking problems.

PHOTOS: LINDSAY FRANCE/CU, JASON KOSKI/CU, CU, UNIVERSITY PHOTOGRAPHY



PLANT STEM CELLS

Michael J. Scanlon, Plant Biology, received a five-year, $7 million NSF award to lead a team of nine researchers in studying the maize shoot apical meristem, a pool of plant stem cells responsible for forming the parts of the corn plant that grow above the ground. Corn is one of the world's most important staple crops and one of the most genetically diverse.

ANIMAL HEALTH

The Starr Foundation committed $6 million to Cornell's College of Veterinary Medicine to create two endowed professorships in clinical research critical to improving animal health.

NEXT-GEN GRAPES

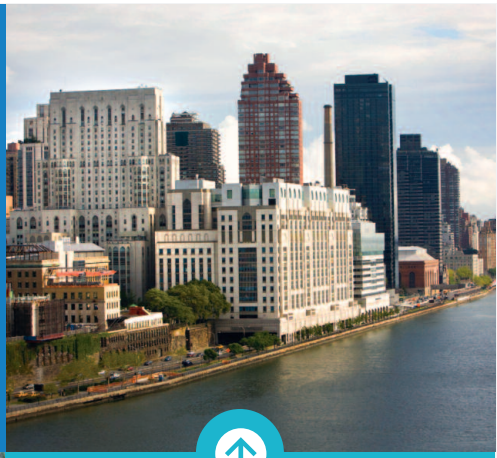
Bruce I. Reisch and Timothy E. Martinson, Horticulture, each with his own approach, will make grape breeding more efficient for the next generation of grapes with their combined grants totaling $4.5 million.

DETERMINING DRUG SAFETY FASTER, COST-EFFECTIVELY

Michael L. Shuler, Biomedical Engineering, received a five-year, $9 million National Institutes of Health grant jointly with a research colleague. They will make 3-D chips with living cells and tissues that model the structure and function of human organs and help predict drug safety.

BIBLICAL TIMELINE

Sturt Manning, Classics/Archaeology, won a $200,000 NSF grant for dendrochronology and radiocarbon dating research in the Near East to pinpoint the early Biblical timeline.



BRAIN AND MIND HEALTH

Weill Cornell Medical College announced a $28 million gift from the Gertrude and Louis Feil Family, establishing the Feil Family Brain and Mind Research Institute, a unique, multidisciplinary translational neuroscience research hub.

GLOBAL INTELLECTUAL PROPERTY

Stacey A. Langwick, Anthropology, received a two-year, $234,000 grant from NSF to examine the shifting forms of ownership and rights to traditional medicine that have emerged from new global intellectual property laws in Tanzania.

PHOTOS: ROBERT BARKER/CU, JASON KOSKI/CU, MANNING FIELDWORK ARCHIVE, PROVIDED

SELECTED NOTABLES
FACULTY ACCOLADES

AT THE MOVIES / Douglas L. James, Computer Science, shared an Academy Award for Technical Achievement with colleagues for engineering wavelet turbulence software, which generates realistic swirling smoke and fiery explosions. The software has been used in *Avatar*, *Monsters vs. Aliens*, *Sherlock Holmes*, *Transformers: Revenge of the Fallen*, *Alice in Wonderland*, *Hugo*, *Puss in Boots*, *Super 8*, *Kung Fu Panda*, *The Amazing Spider-Man*, *Iron Man 3,* and *Man of Steel*.

NATIONAL SCIENCE BOARD / G. Peter Lepage, Physics, was appointed to the National Science Board, which governs the National Science Foundation.

SPACEFLIGHT / Jonathan I. Lunine, Astronomy, was chosen to cochair a new National Research Council committee that is undertaking a study on the future of the human spaceflight program. He will help decide whether, when, and why Americans will next fly in outer space.

CHIEF TECHNOLOGIST / Mason A. Peck, Mechanical and Aerospace Engineering, became NASA's chief technologist in January 2012, serving as principal adviser and advocate for NASA's technology programs and policy. He oversees more than a thousand technology programs and shows how NASA's technologies serve the public.

TOP TECH INNOVATOR / K. Noah Snavely, Computer Science, was named a 2011 TR35—one of *Technology Review*'s top technology innovators under the age of 35. Snavely developed a method to match the details of many still photographs of the same scene and stitch them together into a 3-D rendering.

MERIT / Patrick J. Stover, Nutritional Sciences, received a Method to Extend Research in Time (MERIT) award from the National Institute of Diabetes and Digestive and Kidney Diseases for his long-running research on the molecular genetics and biochemistry of the vitamins folate and vitamin B-12 and their link to colon cancer, cardiovascular disease, and human birth defects. Stover will receive funding for 10 years.

Peter Lepage

FACULTY DISTINCTIONS

American Academy of Arts and Sciences

Geoffrey W. Coates
CHEMISTRY AND CHEMICAL BIOLOGY

Joseph J. Fins
MEDICAL ETHICS/MEDICINE/PUBLIC HEALTH/PSYCHIATRY, WEILL CORNELL MEDICAL COLLEGE

Thomas D. Gilovich
PSYCHOLOGY

Sol M. Gruner
PHYSICS

Kenneth J. Kemphues
MOLECULAR BIOLOGY AND GENETICS

John T. Lis
MOLECULAR BIOLOGY AND GENETICS

Laurent P. Saloff-Coste
MATHEMATICS

David J. Skorton, President
BIOMEDICAL ENGINEERING/MEDICINE/PEDIATRICS, WEILL CORNELL MEDICAL COLLEGE

Steven H. Strogatz
MATHEMATICS/MECHANICAL AND AEROSPACE ENGINEERING

Sandra L. Vehrencamp
NEUROBIOLOGY AND GENETICS/LABORATORY OF ORNITHOLOGY

National Academy of Sciences

Andrew G. Clark
MOLECULAR BIOLOGY AND GENETICS

Juris Hartmanis
COMPUTER SCIENCE

Jon M. Kleinberg
COMPUTER SCIENCE

Paul L. McEuen
PHYSICS

Carl F. Nathan
MICROBIOLOGY AND IMMUNOLOGY, WEILL CORNELL MEDICAL COLLEGE

Éva Tardos
COMPUTER SCIENCE

National Academy of Engineering

Fred B. Schneider
COMPUTER SCIENCE

Christine A. Shoemaker
CIVIL AND ENVIRONMENTAL ENGINEERING

Institute of Medicine

Frank A. Chervenak
OBSTETRICS AND GYNECOLOGY, WEILL CORNELL MEDICAL COLLEGE

Lisa DeAngelis
NEUROLOGY, WEILL CORNELL MEDICAL COLLEGE

Joseph J. Fins
MEDICAL ETHICS/MEDICINE/PUBLIC HEALTH/PSYCHIATRY, WEILL CORNELL MEDICAL COLLEGE

Andrew I. Schafer
MEDICINE, WEILL CORNELL MEDICAL COLLEGE

David J. Skorton, President
BIOMEDICAL ENGINEERING/MEDICINE/PEDIATRICS, WEILL CORNELL MEDICAL COLLEGE

Pulitzer Prize

Fredrik Logevall
HISTORY

John D. and Catherine T. MacArthur Fellowship (Genius Award)

Craig J. Fennie
APPLIED AND ENGINEERING PHYSICS

Sheila Nirenberg
PHYSIOLOGY AND BIOPHYSICS, WEILL CORNELL MEDICAL COLLEGE

Presidential Early Career Award for Scientists and Engineers

A. Salman Avestimehr
ELECTRICAL AND COMPUTER ENGINEERING

David Erickson
MECHANICAL AND AEROSPACE ENGINEERING

Craig J. Fennie
APPLIED AND ENGINEERING PHYSICS

John C. March
BIOLOGICAL AND ENVIRONMENTAL ENGINEERING

Kyle M. Shen
PHYSICS

Ao Kevin Tang
ELECTRICAL AND COMPUTER ENGINEERING

National Science Foundation Early Career Development Award

Christopher Batten
ELECTRICAL AND COMPUTER ENGINEERING

Tanzeem K. Choudhury
COMPUTING AND INFORMATION SCIENCE

Susan Daniel
CHEMICAL AND BIOMOLECULAR ENGINEERING

Ricardo A. Daziano
CIVIL AND ENVIRONMENTAL ENGINEERING

Olivier Elemento
PHYSIOLOGY AND BIOPHYSICS, WEILL CORNELL MEDICAL COLLEGE

Craig J. Fennie
APPLIED AND ENGINEERING PHYSICS

John N. Foster
COMPUTER SCIENCE

Peter I. Frazier
OPERATIONS RESEARCH AND INFORMATION ENGINEERING

Gregory D. Fuchs
APPLIED AND ENGINEERING PHYSICS

Richard G. Hennig
MATERIALS SCIENCE AND ENGINEERING

Jan Lammerding
BIOMEDICAL ENGINEERING

Liam McAllister
PHYSICS

Alyosha C. Molnar
ELECTRICAL AND COMPUTER ENGINEERING

Poul B. Petersen
CHEMISTRY AND CHEMICAL BIOLOGY

Richard D. Robinson
MATERIALS SCIENCE AND ENGINEERING

Ashutosh Saxena
COMPUTER SCIENCE

K. Noah Snavely
COMPUTER SCIENCE

Hakim Weatherspoon
COMPUTER SCIENCE

Guggenheim Memorial Foundation Fellowship

Brian R. Crane
CHEMISTRY AND CHEMICAL BIOLOGY

Gary W. Evans
DESIGN AND DEVELOPMENTAL ANALYSIS

Douglas L. James
COMPUTER SCIENCE

Natalie Mahowald
EARTH AND ATMOSPHERIC SCIENCES

Kerry L. Shaw
NEUROBIOLOGY AND BEHAVIOR

Adam C. Siepel
BIOLOGICAL STATISTICS AND COMPUTATIONAL BIOLOGY

Alfred P. Sloan Foundation Research Fellowship

Serena DeBeer
CHEMISTRY AND CHEMICAL BIOLOGY

William R. Dichtel
CHEMISTRY AND CHEMICAL BIOLOGY

John N. Foster
COMPUTER SCIENCE

Alon Keinan
BIOLOGICAL STATISTICS AND COMPUTATIONAL BIOLOGY

Julius B. Lucks
CHEMICAL AND BIOMOLECULAR ENGINEERING

Rafael N. Pass
COMPUTER SCIENCE

Ashutosh Saxena
COMPUTER SCIENCE

K. Noah Snavely
COMPUTER SCIENCE

Mukund Vengalattore
PHYSICS

Hakim Weatherspoon
COMPUTER SCIENCE

Fulbright Scholar Program

Christopher B. Barrett
APPLIED ECONOMICS AND MANAGEMENT

Abigail C. Cohn
LINGUISTICS

Matthew A. Evangelista
GOVERNMENT

Teresa E. Jordan
EARTH AND ATMOSPHERIC SCIENCES

Sital Kalantry
LAW

Simons Foundation Investigators

Xiaodong Cao
MATHEMATICS

PHOTOS: FRANK DIMEO, LINDSAY FRANCE/CU, JASON KOSKI/CU, WILLIAM STAFFELD, UNIVERSITY PHOTOGRAPHY

Clockwise from upper right: Adam Siepel; Poul Petersen; Éva Tardos; Hakim Weatherspoon; PECASE Recipients David Erickson, Salman Avestimehr, John March, and Kyle Shen; Michael Ashkin; Natalie Mahowald

Yuval Grossman
PHYSICS

Tara Holm
MATHEMATICS

Jon Kleinberg
COMPUTER SCIENCE

American Academy of Arts and Letters Award in Literature

+

Alice Fulton
ENGLISH

Benjamin Franklin Medal in Chemistry

Jerrold Meinwald
CHEMISTRY AND CHEMICAL BIOLOGY

Blavatnik Awards for Young Scientists

+

Johannes Gehrke
COMPUTER SCIENCE

Samie Jaffrey
CHEMICAL BIOLOGY, WEILL CORNELL MEDICAL COLLEGE

Pollock-Krasner Foundation Grant

+

Michael Ashkin
ART

Arnold and Mabel Beckman Foundation Young Investigators

+

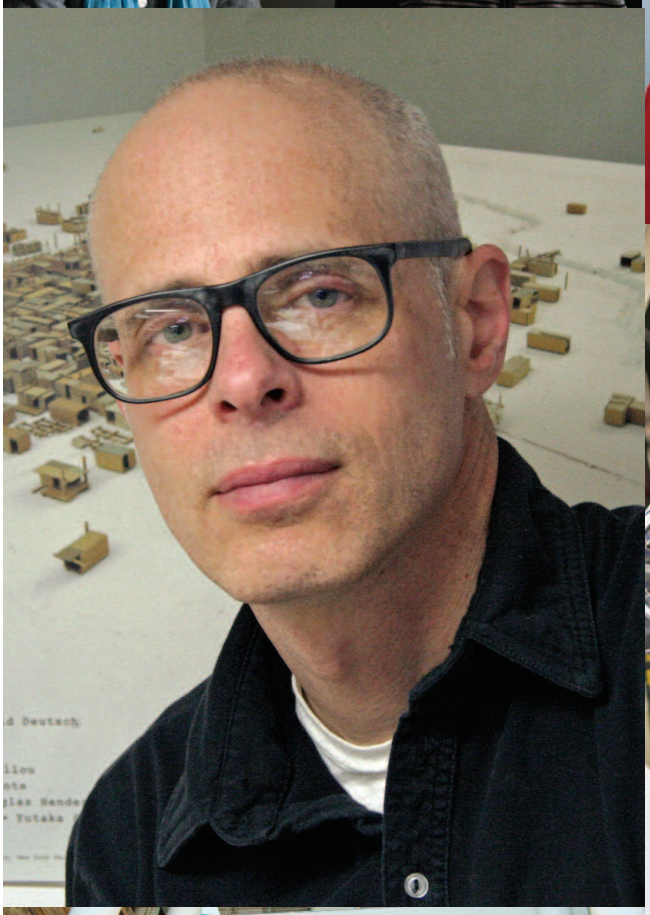
Poul Petersen
CHEMISTRY AND CHEMICAL BIOLOGY

William R. Dichtel
CHEMISTRY AND CHEMICAL BIOLOGY

American Astronomical Society, Dirk Brouwer Award

+

Joseph A. Burns
ASTRONOMY/ MECHANICAL AND AEROSPACE ENGINEERING

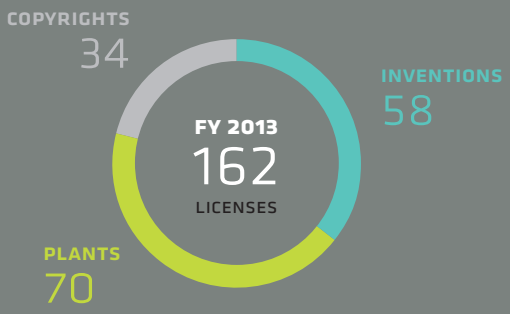


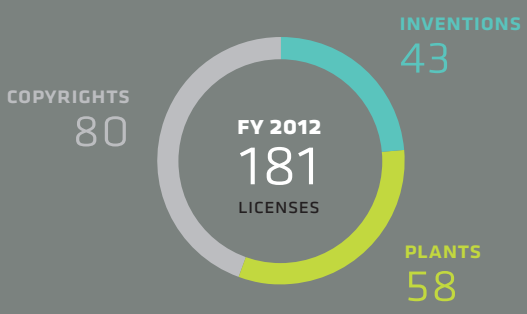
PHOTOS: LINDSAY FRANCE/CU, PROVIDED

CORNELL TECHNOLOGY TRANSFER AND ECONOMIC DEVELOPMENT

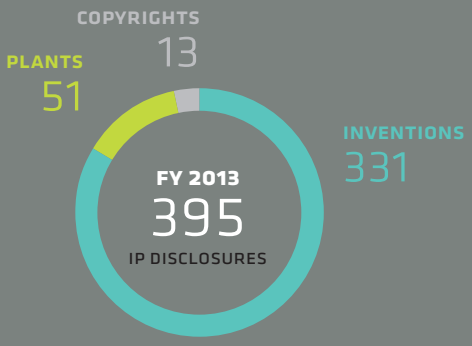
CORNELL TECHNOLOGY TRANSFER AND ECONOMIC DEVELOPMENT STATS

LICENSES

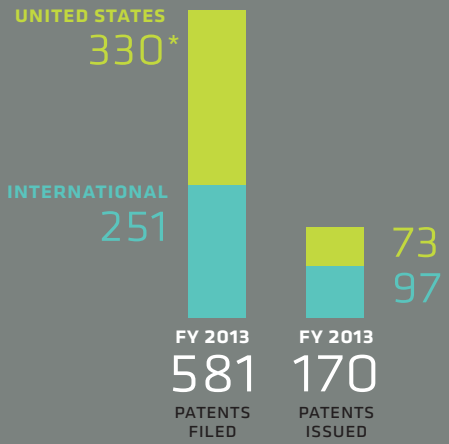


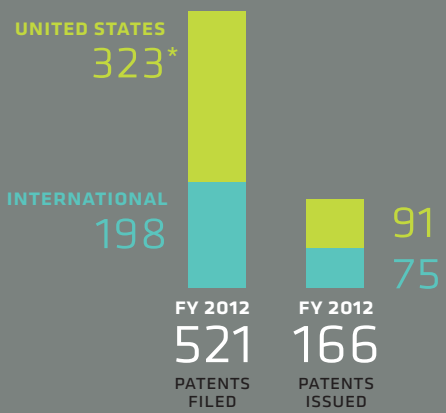


IP DISCLOSURES



PATENTS FILED AND ISSUED





* Includes provisional and nonprovisional patent applications

/ dollars in thousands

$10,959 FY 2013 Total Revenue

7,655	3,107	197
Fees and Royalties	Patent Expense Reimbursements	Extraordinary Income**

$12,644 FY 2012 Total Revenue

9,132	3,037	474
Fees and Royalties	Patent Expense Reimbursements	Extraordinary Income**

8 Companies started FY 2013

7 Companies started FY 2012

LICENSING LOCALES

FY 2013

41	94	28
New York	All Other States	International

FY 2012

74	97	10
New York	All Other States	International

** Includes nonrecurring income, such as sale of equity and dispute settlements

Source: Cornell Center for Technology, Enterprise, and Commercialization (CCTEC)

THE PURPLE WONDER

Courtney A. Weber, Horticulture, released a sweet, aromatic, thoroughly purple strawberry—medium-sized and full of antioxidants. The Purple Wonder, the 42nd strawberry released by the Cornell small-fruits breeding program, is targeted for home berry growers. It is the darkest strawberry available and can also be used for deep-colored preserves and strawberry wine. The W. Atlee Burpee & Company debuted the berry in March 2012 through an exclusive licensing agreement. CCTEC filed a plant patent.

PHOTOS: BURPEE

NEW COMPANIES BASED ON CORNELL RESEARCH AND TECHNOLOGY

2011

LAGUNA BEACH, CA
Axium Nanofibers LLC
Nanofiber technology for air and water filter products
+
Faculty Research Lab / Yong Joo, Chemical and Biomolecular Engineering, and Anil Netravali, Fiber Science and Apparel Design

RADNOR, PA
BioPancreate Inc.
New therapies for diabetes using genetically enhanced commensal bacteria
+
Faculty Research Lab / John March, Biological and Environmental Engineering

TAMARAC, FL
CEP Biotech Inc.
Diagnostics based on a predictive biomarker for melanocyte proliferation
+
Faculty Research Lab / Lonny Levin and Jochen Buck, Pharmacology, and Jonathan Zippin, Dermatology, Weill Cornell Medical College

ITHACA, NY
Glycobia Inc.
Low-cost glycoproteins for biotherapeutics
+
Faculty Research Lab / Matthew DeLisa, Chemical and Biomolecular Engineering

TUCSON, AZ
Kphotonics LLC
Mode-locked fiber lasers for research and education
+
Faculty Research Lab / Frank Wise, Applied and Engineering Physics

NEW YORK, NY
Lucerna Inc.
Nucleic acid-based fluorescent sensors for point-of-care diagnostics and other uses
+
Faculty Research Lab / Samie Jaffrey, Pharmacology, Weill Cornell Medical College

ITHACA, NY
MADathletic Inc.
Contact sports training device
+
Inventor / Pete DeStefano, Assistant Football Coach

ITHACA, NY
SafetyStratus Inc.
Subscription cloud computing software for workflow and inspections at research institutions
+
Inventor / Cornell Environmental Health and Safety

BOSTON, MA
SaltCheck Inc.
Urine-based salt intake monitoring system requiring no laboratory
+
Faculty Research Lab / Samuel Mann, Medicine, and Linda Gerber, Public Health, Weill Cornell Medical College

ITHACA, NY
Zuma BioSciences LLC
Therapeutics for disrupting cancer growth
+
Faculty Research Lab / Richard Cerione, Molecular Medicine/ Chemistry and Chemical Biology

2012

AYER, MA
Alcyone LifeSciences Inc.
Products for treating neuropathological conditions
+
Faculty Research Lab / William Olbricht, Chemical and Biomolecular Engineering

NEW YORK, NY
Boa-Bag LLC
An improved laparoscopic tissue removal bag for use during laparoscopic surgery
+
Faculty Research Lab / Christopher Towe, Surgical Resident, Weill Cornell Medical College

ITHACA, NY
NOHMs Technologies Inc.
Battery materials using new nanoscale chemistry
+
Faculty Research Lab / Lynden Archer, Chemical and Biomolecular Engineering

PHILADELPHIA, PA
Optofluidics Inc.
Microfluidic and biophotonic technologies for single-molecule analysis and point-of-care medical diagnostics
+
Faculty Research Lab / David Erickson, Mechanical and Aerospace Engineering

NEW YORK, NY
Prolias Technologies
Products and services for determining the malignancy of thyroid tumors and the likelihood of transplant rejection
+
Faculty Research Lab / Weill Cornell Medical College

ITHACA, NY
Seraph Robotics Inc.
Personal robotics company with the product Seraph ONE™, a 3-D printer that generates 3-D printed products such as human organs and food items
+
Faculty Research Lab / Hod Lipson, Mechanical and Aerospace Engineering

WASHINGTON, CT
Telescope Time Inc. (Sloosh)
Space photo online sharing, partnering with Google Sky to map the universe and promote live astronomy
+
Faculty Research Lab / Computing and Information Science

/ Early 2013

NEW YORK, NY

Angiocrine Bioscience Inc.

Research and therapeutic products using stem and endothelial cell-related technologies

+

Faculty Research Lab / Shahin Rafii, Ansary Stem Cell Institute, Weill Cornell Medical College

ITHACA, NY

Empire Robotics Inc.

Innovative robotic solutions for the industrial automation industry

+

Faculty Research Lab / Hod Lipson, Mechanical and Aerospace Engineering

JESSUP, MD

PicoLuz LLC

Light sources and optical measurement systems based on nonlinear nanophotonic devices

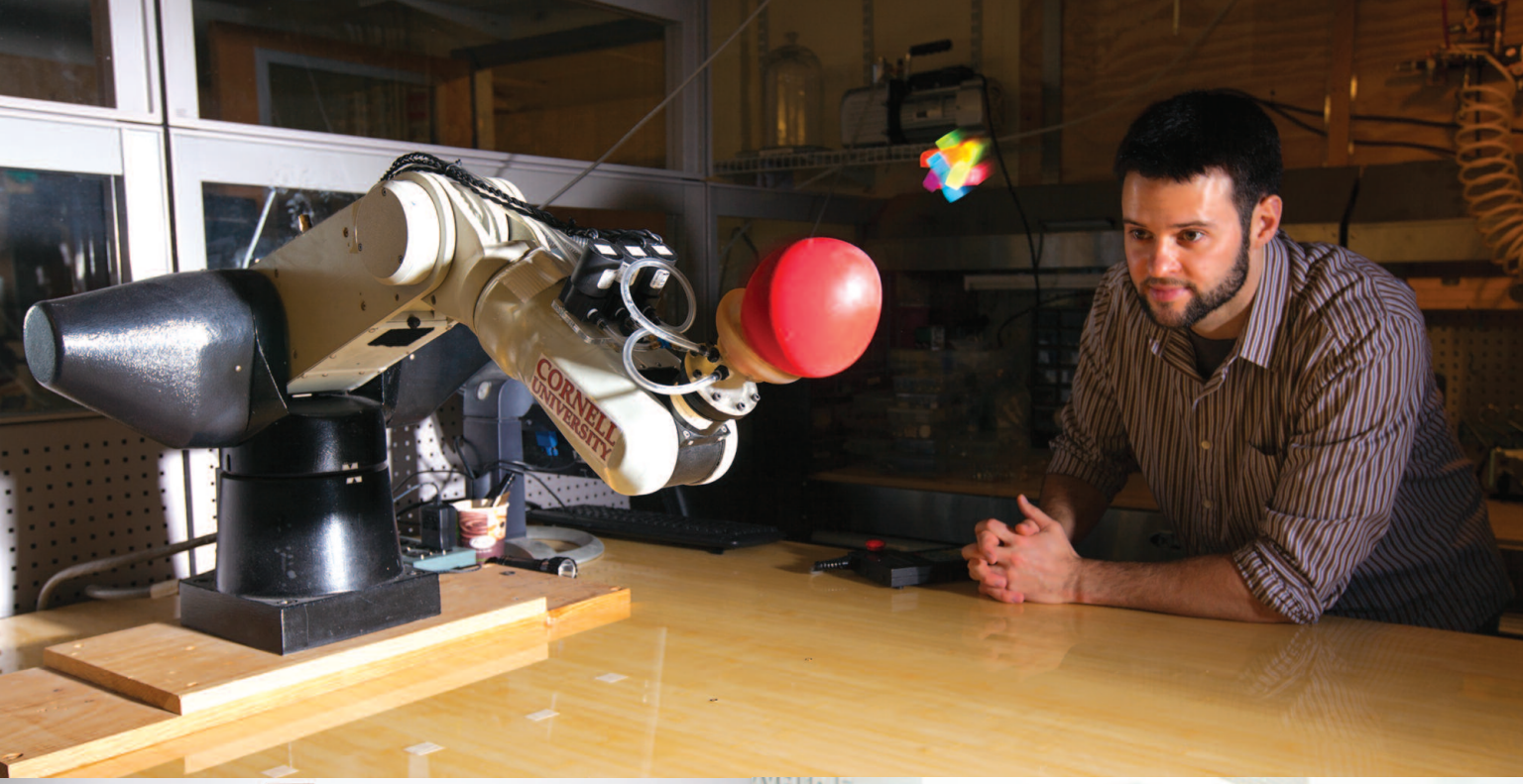
+

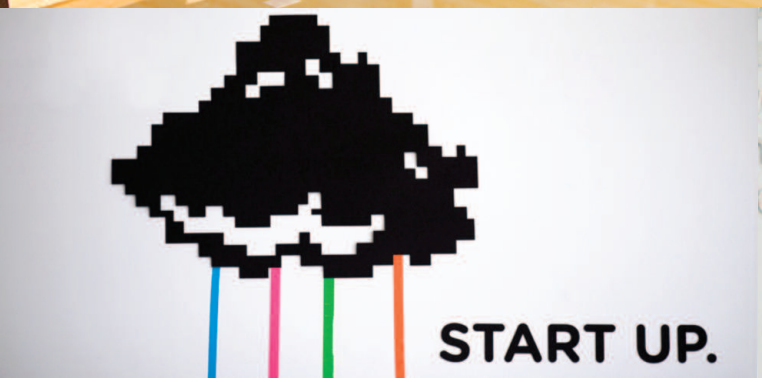
Faculty Research Lab / Michal Lipson, Electrical and Computer Engineering and Alexander Gaeta, Applied and Engineering Physics

PHOTOS: LINDSAY FRANCE/CU, UNIVERSITY PHOTOGRAPHY

GROWING CORNELL START-UPS

The Kevin M. McGovern Family Center for Venture Development in the Life Sciences—established to assist Cornell high-potential, early-stage life science spin-off companies—welcomed its first client, Glycobia, in February 2012. In March, high-tech start-up DNANO Systems joined the client list. Seraph Robotics joined in June. DNANO's tenure ended in April 2013, and SteriFreeMed joined in September 2013. ArcScan became a tenant in October 2013. The McGovern Center helps Cornell start-ups to prove their technologies, solidify management teams, strengthen business plans, and obtain investments to support the companies' further growth.





+

GLYCOBIA produces low-cost glycoengineering technology, which works by modifying common bacteria such as *E. coli* to directly produce human peptide, protein, and antibody drugs. The technology originated in the lab of Matthew DeLisa, Chemical and Biomolecular Engineering, where the team invented a novel method for engineering human therapeutic glycoproteins simply and quickly using *E. coli* bacteria as a platform.

+

STERIFREEMED probes cold plasma technology applications for rapid room temperature sterilization. Cornell alumnus and former research associate Czeslaw Golkowski from the Department of Applied and Engineering Physics is the inventor and company CEO.

+

ARCSCAN pursues state-of-the-art ophthalmic imaging. The company's ultra-high, ultrasound diagnostic device, Artemis III, maps a patient's eye in comprehensive 3-D images. The medical instrument was developed at Weill Cornell Medical College.

+

SERAPH ROBOTICS explores life science applications of the robotic 3-D printing technology platform, which descended from a Fab@Home project developed in the lab of Hod Lipson, Mechanical and Aerospace Engineering. The company is innovating a Fab@Home Model 3, a microindustrial robot designed for versatility.

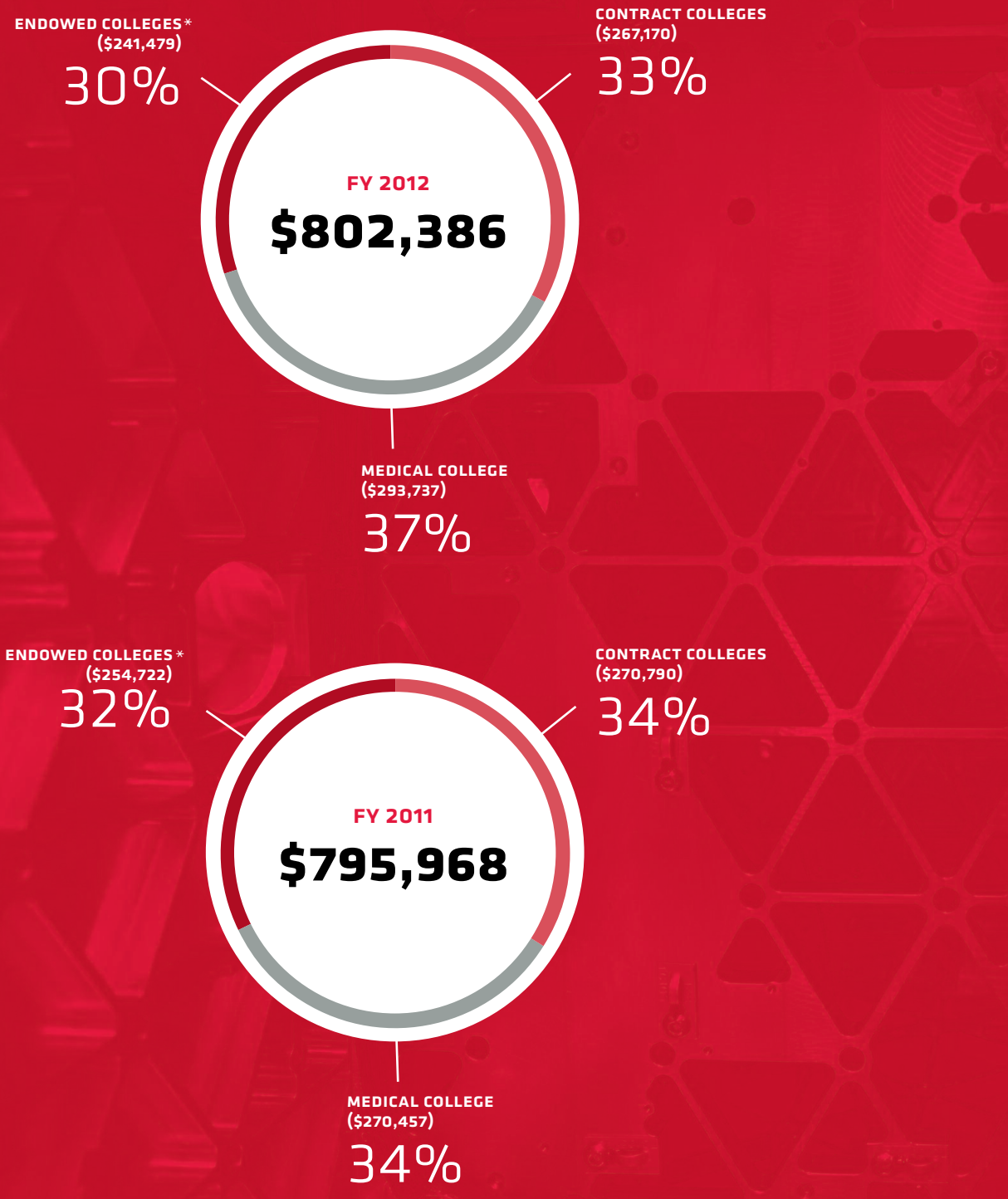
PHOTOS: ROBERT BARKER/CU, LINDSAY FRANCE/CU, JASON KOSKI/CU

PHOTOS: FRANK DIMEO, LINDSAY FRANCE/CU

FUNDING CORNELL'S RESEARCH

CORNELL'S TOTAL RESEARCH EXPENDITURES

/ dollars in thousands



* Includes the Research Division

LINDSAY FRANCE/CU

CORNELL RESEARCH DOLLARS EXPENDED

by FUNDING SOURCE

/ dollars in thousands

		FY 2012	FY 2011
Total Federal Funds		**$472,673**	**$490,217**
Sponsored Research		466,403	482,711
Appropriated Research*		6,270	7,506
Total Nonfederal Funds		**329,713**	**305,751**
Sponsored Research		130,982	117,350
Foundations		71,726	66,270
Corporations & Trade Associations		31,365	23,003
State & Local Governments		14,719	14,180
Nonprofit Organizations		10,960	13,017
All Others		2,211	880
New York State		49,161	47,531
Cornell Support**		149,570	140,870
Federal Agencies			
DHHS	Department of Health & Human Services	232,673	242,320
NSF	National Science Foundation	129,984	139,136
DOD	Department of Defense	30,426	27,467
USDA	Department of Agriculture	26,677	25,306
DOE	Department of Energy	20,304	19,919
NASA	National Aeronautics & Space Administration	12,277	13,372
AID	Agency for International Development	4,422	3,494
	All Others	9,639	11,696

* Includes federal appropriated funds, such as Hatch and other federal budgeted dollars for colleges and universities.

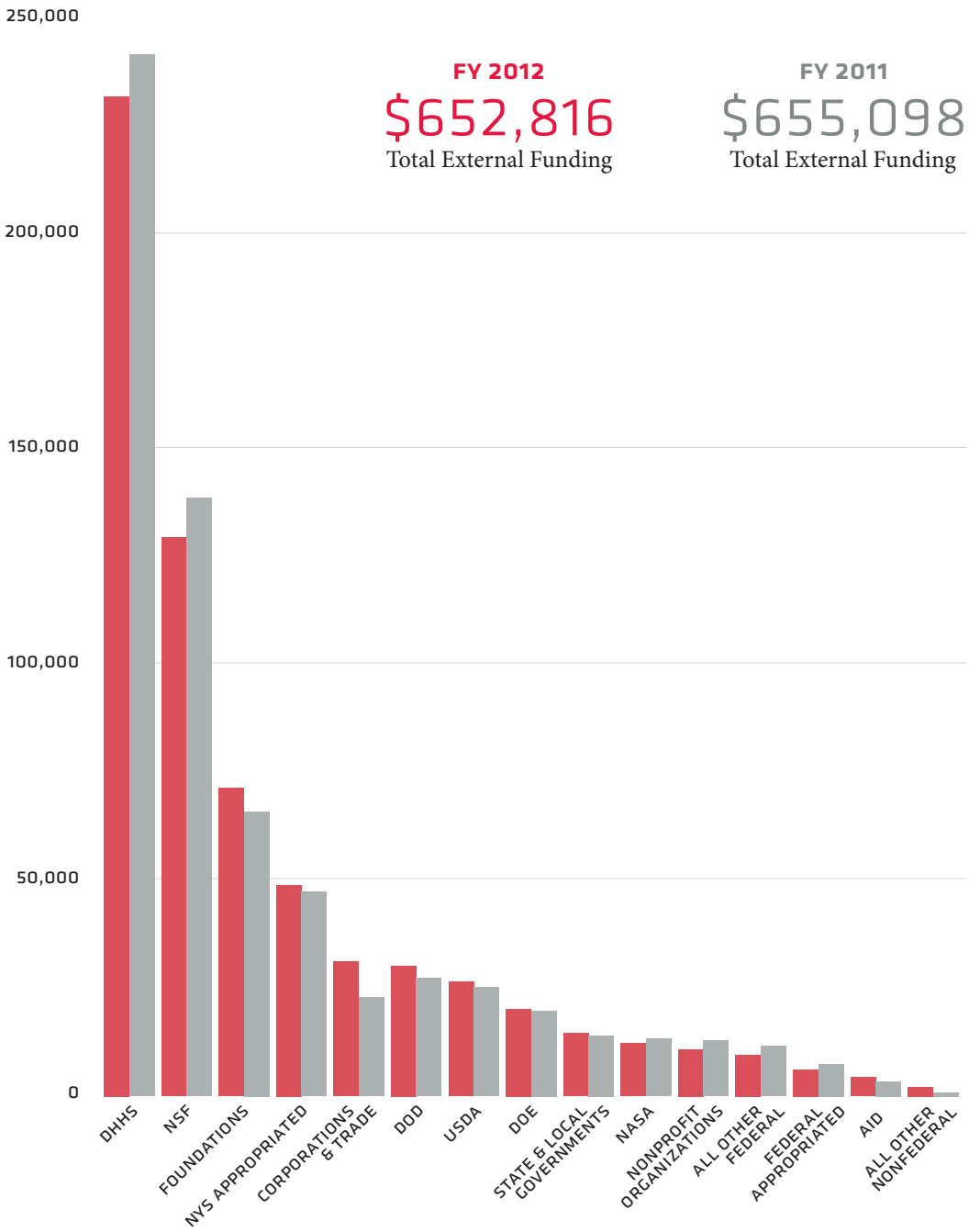
** Consistent with NSF reporting guidelines, university support includes institutional cost sharing, GRA tuition fellowships, university seed research grants, unrecovered facilities and administration costs, and organized research allocation of NYS-funded employee benefits.

Source: Cornell University, Sponsored Financial Services

CORNELL RESEARCH EXTERNAL SPONSORS

by DOLLARS EXPENDED

/ dollars in thousands



Source: Cornell University, Sponsored Financial Services

CORNELL RESEARCH DOLLARS EXPENDED

by DISCIPLINES

/ dollars in thousands

	FY 2012	FY 2011
Medical Sciences	343,469	$320,559
Biology	124,125	114,933
Multidisciplinary	61,478	67,765
Agriculture	61,614	66,090
Physics	39,399	43,740
Astronomy	24,183	27,595
Chemistry	20,316	20,697
Computer Sciences	18,372	17,674
Economics	15,589	14,828
Electrical Engineering	14,243	14,660
Sociology	10,136	11,278
Metallurgical & Materials Engineering	9,881	10,087
Mechanical Engineering	9,787	10,082
Institutional & College Research Support*	5,017	9,996
Bioengineering & Biomedical Engineering	6,745	9,126
Earth Sciences	7,677	8,310
Psychology	8,079	7,603
Chemical Engineering	6,827	6,078
Civil Engineering	5,522	5,115
Mathematical Sciences	3,727	4,857
Other Social Sciences	1,787	3,335
Communication, Journalism & Library Sciences	1,870	619
Humanities	415	576
Business & Management	5	123
Oceanography	223	114
Political Sciences	98	63
Law	215	62
Other Engineering	1,512	–
Visual and Performing Arts	69	–

+ 8%
Biology

+ 7.1%
Medical Sciences

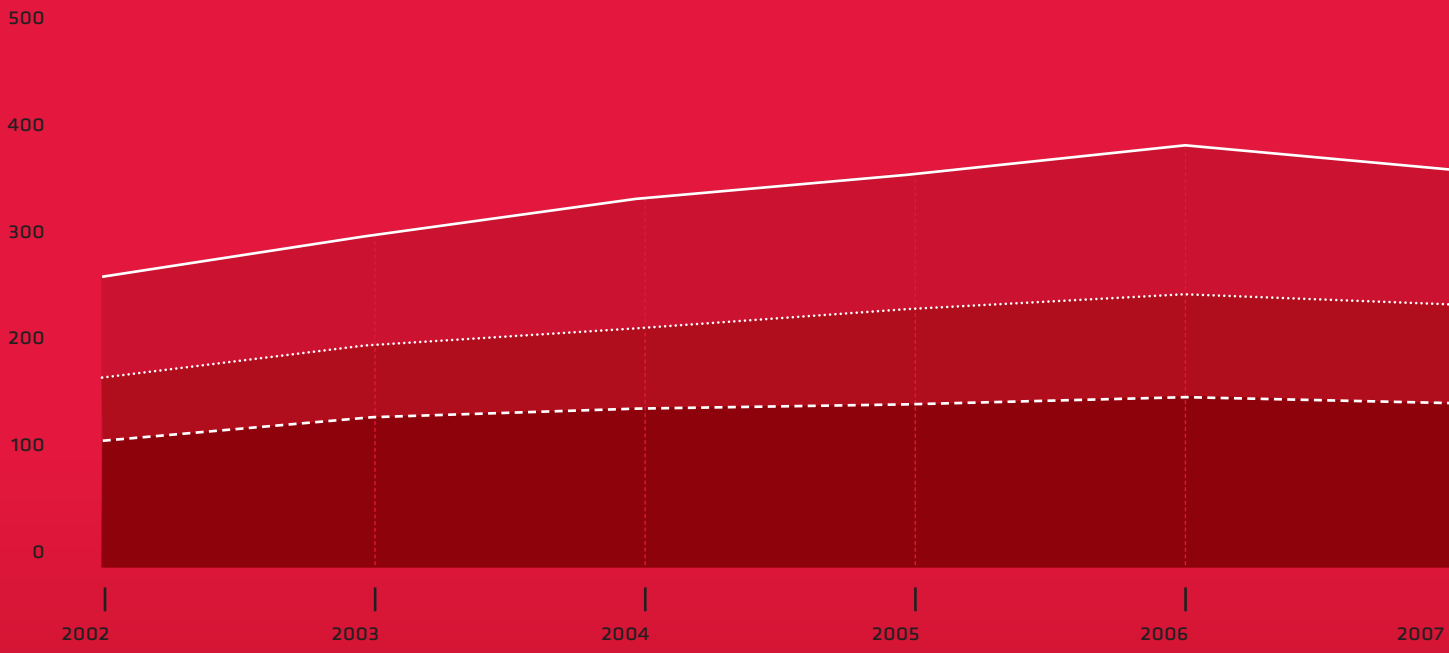
+ 5.1%
Economics

+ 4%
Computer Sciences

* Expenses incurred at the administrative unit level in support of research.
Disciplines are defined by the National Science Foundation.
Source: Cornell University, Office of Sponsored Accounting

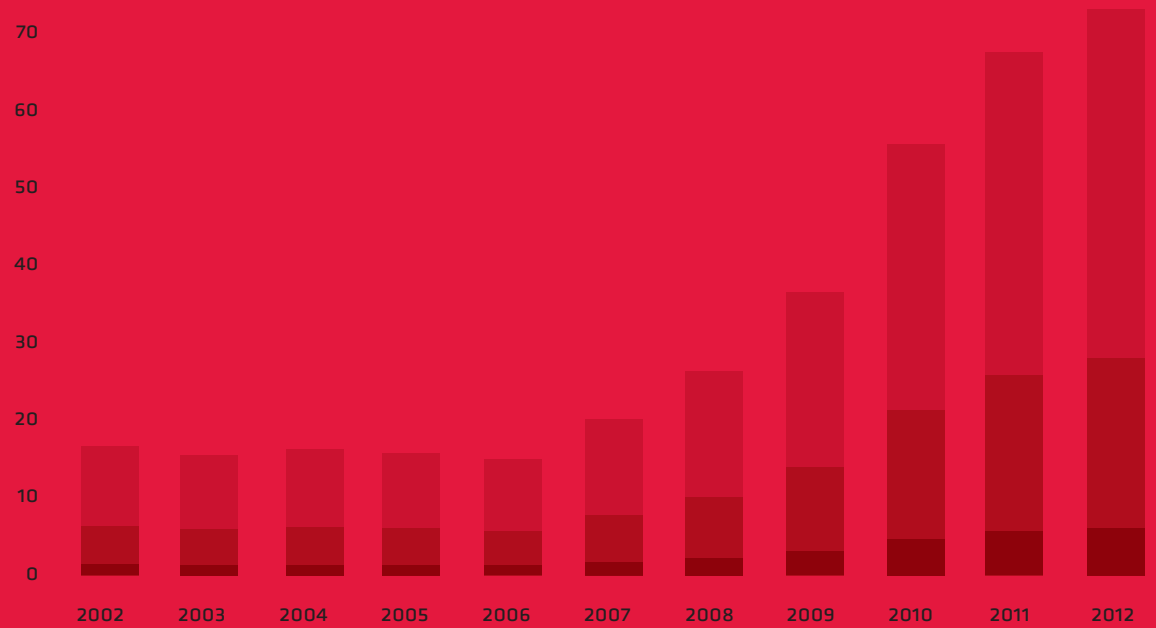
TRENDS
IN CORNELL RESEARCH FUNDING BY DIVISIONS

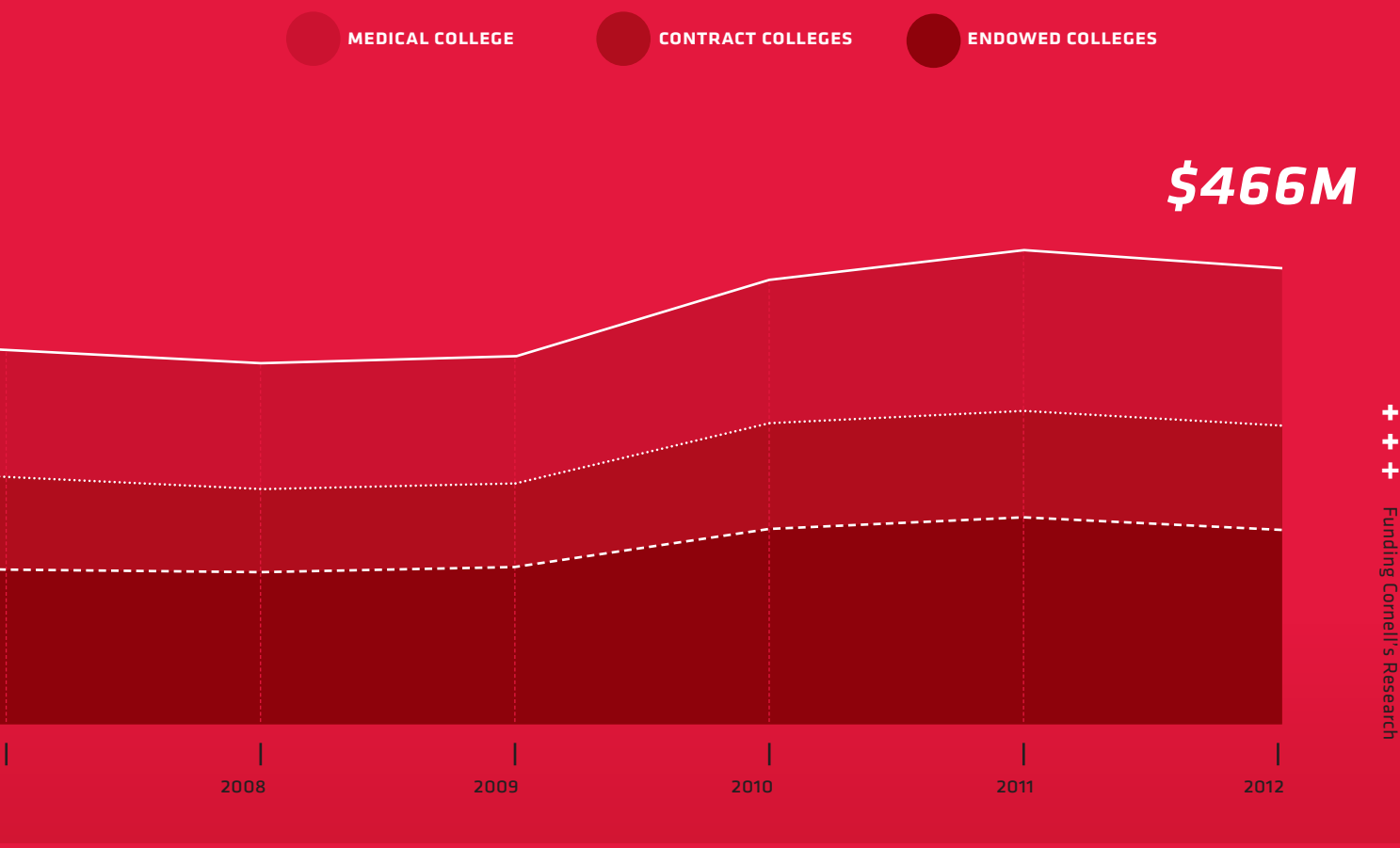
FEDERALLY FUNDED RESEARCH EXPENDITURES



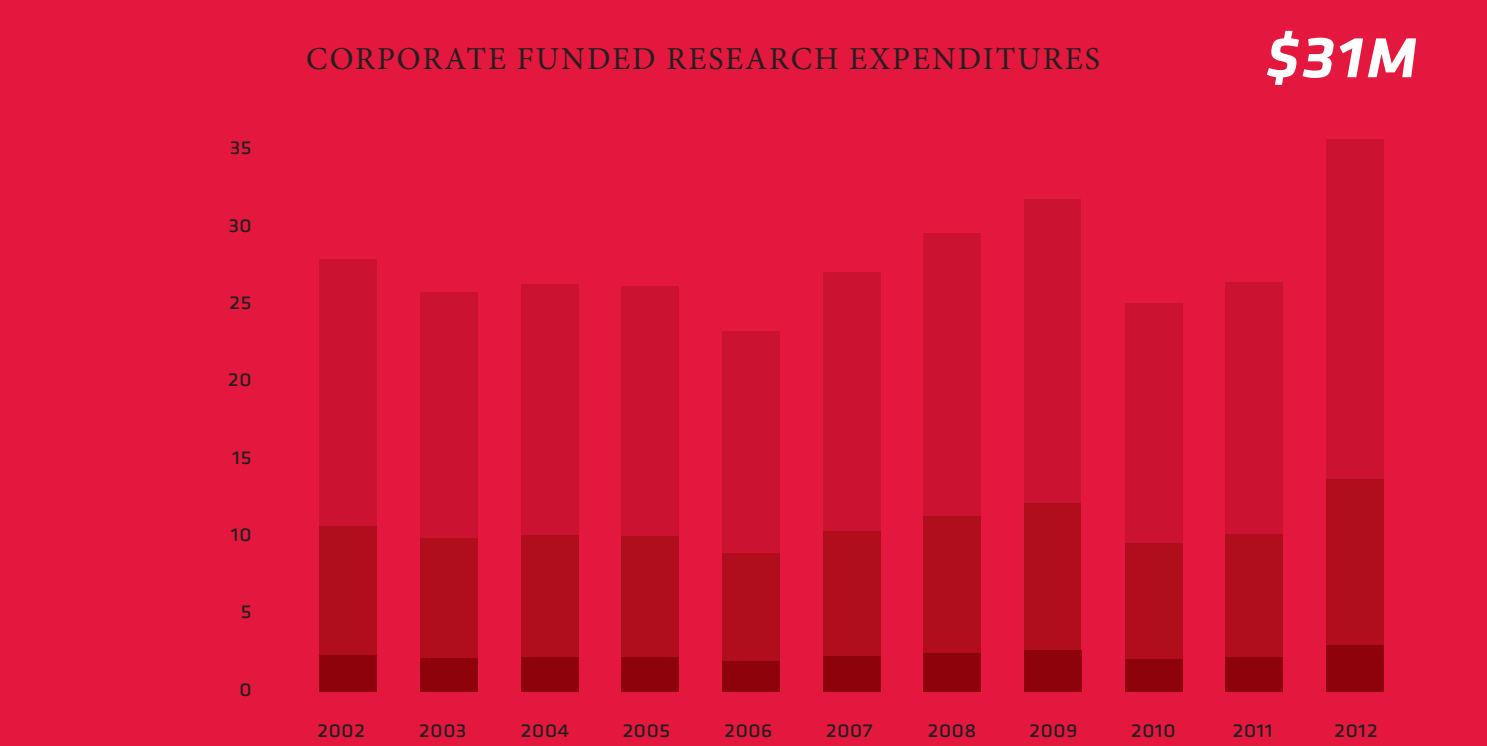
FOUNDATION FUNDED RESEARCH EXPENDITURES

$72M





CORPORATE FUNDED RESEARCH EXPENDITURES



THE RESEARCH DIVISION

The Cornell Research Division, headed by the Senior Vice Provost for Research, advances and enables the university's research priorities as well as the research activities of Cornell colleges, schools, and research centers, institutes, and laboratories.

The Research Division Comprises

Multidisciplinary Research Centers, Institutes, and Facilities

Center for Advanced Computing
Center for Applied Mathematics
Center for Radiophysics and Space Research
Center for Vertebrate Genomics
Center on the Microenvironment and Metastasis
Cornell Center for Animal Resources and Education
Cornell Center for Comparative and Population Genomics
Cornell Center for Materials Research
Cornell Institute for Social and Economic Research
Cornell Laboratory for Accelerator-Based Sciences and Education
David R. Atkinson Center for a Sustainable Future
Energy Materials Center at Cornell
Institute for the Social Sciences
Institute of Biotechnology and Biotechnology Resource Center
Kaust-Cornell Center for Energy and Sustainability
Kavli Institute at Cornell for Nanoscale Science
Kevin M. McGovern Family Center for Venture Development in the Life Sciences
Laboratory of Atomic and Solid State Physics
Nanobiotechnology Center
Survey Research Institute
Weill Institute for Cell and Molecular Biology

National Research Centers

Cornell High Energy Synchrotron Source
Cornell NanoScale Science and Technology Facility

Research Support Services

Cornell Center for Technology Enterprise and Commercialization
Office of Research Integrity and Assurance
Office of Sponsored Programs
Office of the Vice Provost for Research

AT A GLANCE

2	21	4	1,000
National Research Centers	Multidisciplinary Research Centers	Research Support Offices	Academic and Nonacademic Staff

FRANK DIMEO

CORNELL'S COLLEGES, SCHOOLS & FACULTIES

College of Agriculture and Life Sciences

College of Architecture, Art, and Planning

College of Arts and Sciences

College of Engineering

College of Human Ecology

College of Veterinary Medicine

Cornell NYC Tech

Faculty of Computing and Information Science

Graduate School

Johnson Graduate School of Management

Law School

School of Continuing Education and Summer Sessions

School of Hotel Administration

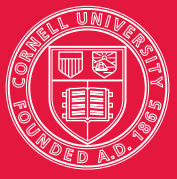
School of Industrial and Labor Relations

Weill Cornell Graduate School of Medical Sciences, New York City

Weill Cornell Medical College, New York City

Weill Cornell Medical College, Qatar

PHOTOS: ROBERT BARKER/CU, LINDSAY FRANCE/CU, JASON KOSKI/CU



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