Yi Qian is an assistant professor in marketing and the Kraft Research Professor at Kellogg School of Management and a faculty associate in the Institute for Policy Research. Qian’s research interests shape around marketing strategies in the context of technology advancement and international trade. She applies this knowledge to propose successful business strategies to secure brand values and intellectual property rights against counterfeits and to suggest reasonable policies in adopting technology and absorbing foreign direct investments. Read about one of her research projects on page 40.

Celeste M. Watkins-Hayes is an associate professor of sociology and African American studies in Weinberg College of Arts and Sciences. She also is a faculty fellow in the Institute for Policy Research (IPR). Her research involves urban poverty; social policy; HIV/AIDS; formal organizations (non-profit and government); and race, class, and gender. Her book, The New Welfare Bureaucrats: Entanglements of Race, Class, and Policy Reform, investigates how welfare office employees navigate the increasingly tangled political and emotional terrain of their jobs. Watkins-Hayes is currently working on a study of the social consequences of HIV/AIDS for Chicago-area women. She also is a member of IPR’s Cells to Society (C2S): The Center on Social Disparities and Health. Read more about one of her research studies on page 49.

Igal Szleifer is Christina Enroth-Cugell Professor of Biomedical Engineering and (by courtesy) professor of chemical and biological engineering in McCormick School of Engineering and Applied Science and professor of chemistry in Weinberg College of Arts and Sciences. His group focuses on the fundamental understanding of the properties of complex molecular systems that encompass problems at the interface between biology, chemistry, physics, and materials science. An article about his research may be found on page 46.
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President Morton Schapiro and Vice President for Research Jay Walsh visit Silverman Hall, where the symbol for the molecule pregabalin (Lyrica) is set into the terrazzo.
December 2009

Dear Colleagues,

Last summer, a month or so before his inauguration, I had the pleasure of taking Morty Schapiro on a walking tour through a few Northwestern research labs where he got to see firsthand the work being done by our faculty, students, and post-doctoral fellows. We visited laboratories on both campuses, spoke with researchers doing the most fundamental basic science and those doing translational and applied science. We visited labs where the faculty were investigating macroscopic problems as well as labs devoted to the characterization and manipulation of materials at the nanoscale. We saw cutting-edge work being done in facilities in our newest buildings as well as world-class investigations underway in our most revered older buildings. Everywhere, not surprisingly, students and faculty showed great passion for their work and were excited to explain the impact that their results will have on our understanding of the world and the lives of those around us. We welcome President Schapiro and look forward to working with him for many years.

The festivities associated with President Schapiro’s inauguration were part of a year of significant milestones in Northwestern’s history. These milestone celebrations include: the 100th anniversary for the McCormick School of Engineering and Applied Science (founded in 1909 as the College of Engineering); the 150th anniversary of Northwestern’s Law School (founded in 1859 as Union College of Law, a department of the now defunct Chicago University, the first law school in Chicago); and the 150th anniversary of what is now the Feinberg School of Medicine (founded in 1859 as the Chicago Medical College). Few entities in society prosper and grow over such long periods of time. The many faculty members, students, and staff who have been a part of these schools should be proud of the role they played in advancing the excellence of Northwestern and giving us great reason to celebrate these milestones.

This year, we welcomed the American Recovery and Reinvestment Act of 2009 (ARRA), evidence of the support and commitment of the U.S. government to University research. ARRA funding provided a much-needed boost for research across the University and enables us to create new jobs, modernize science facilities, and train a new generation of scientists and engineers. Northwestern faculty did very well in garnering federally sponsored research funding awarded under the ARRA. To date our faculty have received more than 180 awards totalling more than $100 million.

Many people contributed to our ARRA success. The expertise and dedication of staff in Accounting Services for Research and Sponsored Programs (ASRSP), the Office for Sponsored Research (OSR), Effort Reporting, Project Café, and Human Resources Information Systems (HRIS) have been vital to making this process smooth and effective. Many of them worked evenings and weekends to make sure that faculty submissions went out accurately and in a timely manner. In the past several months the number of proposals Northwestern has submitted has increased by more than 60 percent over historic submission rates. It bears repeating that this was accomplished through the hard work of our staff as well as our faculty, and we are grateful to all of those who have been participating in this unprecedented opportunity.

As you will see in the pages that follow, this year we once again recorded a historic high in research awards: we received $476.9 million in awards, an increase of
9 percent ($38.2 million) over FY2009. The bulk of these awards—71.9 percent or $342.9 million—came from the federal government. It is important to note, however, that not all of the increase came from federal funding. While we increased our federal funding by 4 percent ($14.6 million), we also increased our funding from industrial sponsors by 57 percent ($25.9 million). Voluntary health organization awards also rose by 17 percent ($2.8 million). Please see pages 50-53 for a detailed breakdown of our sponsored research dollars.

**Energy Research at Northwestern**

One area that has been greatly strengthened through government and other funding this year has been that of energy research. Northwestern faculty are now leading a new institute for solar energy conversion funded by the National Science Foundation (NSF) as well as two Energy Frontier Research Centers (EFRCs).

The $4 million NSF International Materials Institute for Solar Energy Conversion is developing a network of global materials researchers and training young U.S. researchers, as well as informing and educating citizens about solar energy stewardship. R. P. H. Chang, materials science and engineering as well as the director of the Materials Research Institute, runs the institute, which is funded by the NSF through the ARRA.

Northwestern also is home to two of the 46 multi-million-dollar EFRCs funded by the U.S. Department of Energy (DOE) Office of Science. The DOE plans to support each center at a level of $19 million for a five-year period.

Michael Wasielewski, chemistry, leads an EFRC that is part of the existing Argonne-Northwestern Solar Energy Research Center (ANSER), of which he is director. The goal of this EFRC is to revolutionize the design, synthesis, and control of molecules, materials, and processes in order to improve dramatically the conversion of sunlight into electricity and fuels.

Bartosz Grzybowski, chemical and biological engineering and chemistry, leads a second EFRC, which is supported by ARRA funding. The focus of the new Non-equilibrium Energy Research Center (NERC) is to synthesize, characterize and understand new classes of materials under conditions far from equilibrium that are relevant to solar energy conversion, catalysis, and storage of electricity and hydrogen.

In addition to leading two Northwestern-based EFRCs, University researchers also are involved in collaborations with six other EFRCs, including two based at Argonne National Laboratory: the Institute for Atom-Efficient Chemical Transformations (IACT) and the Center for Electrical Energy Storage: Tailored Interfaces (CEES). Preliminary estimates show these six other centers could provide Northwestern with additional funding of up to $12 million, bringing the total EFRC funding at the University to more than $50 million.

The 46 EFRCs were selected from a pool of some 260 applications received in response to a solicitation issued by the DOE Office of Science in 2008. The fact that Northwestern is leading two EFRCs and participating in six others is outstanding—and puts us on the map as an important center for energy research in the nation.

We can’t talk about energy research at Northwestern without mentioning the groundbreaking efforts of ISEN, the Initiative for Sustainability and Energy at Northwestern, in its inaugural year. First announced in October 2008 by then-University President Henry Bienen, ISEN was created as an umbrella group to draw together the various projects throughout the University that address the science, technology, and policy for sustainability and energy. Mark Ratner, chemistry, materials science and engineering, codirects ISEN with David Dunand, materials science and engineering.

As Mark reminds me, Northwestern has a substantial history of climate-based energy research that goes back many decades. As an example, some of you may know that Charles Keeling, who received his PhD in chemistry here in 1954, went on to measure more than a half century of atmospheric carbon dioxide (CO₂). His data show the annual cycle and the progressive increase in atmospheric CO₂ and thus give us significant quantitative data linking anthropomorphic sources of carbon dioxide to climate changes. We still use the Keeling Curve to measure the progressive buildup of atmospheric carbon dioxide.

Last spring ISEN selected 10 graduate students from a diverse set of programs—including Earth and planetary...
sciences, chemistry, various engineering disciplines, and journalism—to become the first ISEN Cluster Fellows. This fall these fellows, who receive full tuition scholarships and stipends for one quarter, began taking required ISEN graduate courses. These students have the opportunity to work on their own research as well as explore new subjects to enrich their work.

The One Book One Northwestern committee selected Thomas Friedman’s *Hot, Flat and Crowded* with the goal of enhancing our understanding of the global climate crisis and to become more mindful of the consequences of current human activities. Friedman’s espousal of energy technology, based on clean power and energy efficiency, as the next great global industry is very much in keeping with the direction Northwestern research is heading.

**Silverman Hall and Shared Facilities**

In November, I participated in the dedication of the Richard and Barbara Silverman Hall for Molecular Therapeutics and Diagnostics on our Evanston campus. What a phenomenal gift from the whole Silverman family and a wonderful celebration. As many of you likely know, work in the Silverman lab in the 1980s led to the invention of the novel compound pregabalin, now marketed by Pfizer as Lyrica, which is used for the treatment of epilepsy, neuropathic pain and chronic pain as associated with fibromyalgia, for example. We fully expect that Silverman Hall, with an open structure that encourages collaboration and cross-disciplinary work, will promote even more such discoveries.

Silverman Hall’s ground floor features a major biological imaging center that will allow researchers from the Chicago and Evanston campuses to image molecules, chemical reactions, and magnetic resonance contrast agents, to name just a few potential uses. Tom Meade, chemistry, biochemistry, molecular biology and cell biology, neurobiology and physiology, and radiology, heads the center, which will focus on experimental research using biological molecular imaging as a tool. The instruments housed there will be able to image at impressive resolution. There are only about a half dozen comprehensive imaging centers in North America like the one in Silverman Hall.

The center will be surrounded by the chemists, biologists, and engineers who make up the Chemistry of Life Processes Institute, headed by Tom O’Halloran, chemistry. Researchers from these disciplines won’t just hear about what’s going on—they’ll actually see what’s going on. This line-of-sight proximity, where everyone works shoulder to shoulder, will be crucial to future discovery, allowing us to solve problems that require innovation at disciplinary interfaces.

Silverman Hall houses other core facilities with shared instrumentation including facilities for therapeutics and diagnostics, proteomics and genomics, and computational bioinformatics. The proteomics facility is one of Northwestern’s newest initiatives. It supports the study of those proteins that are expressed and thus offers an insight into cell function that extends beyond that gained from the study of the genome.

In other infrastructure news, this past year we opened a new research computing facility at 2020 Ridge in Evanston to accommodate Quest—Northwestern’s new, high-performance computing (HPC) cluster. Computational research is used to conduct scientific investigations and produce advanced visualizations in a variety of fields, including medicine, materials science, physics and astronomy, and chemistry. Computational research has penetrated into a greater number of fields in the past several years as the cost of computing has dropped. The current challenge in academia, and elsewhere, often is not the cost of the capital equipment (the computing clusters) but the costs associated with the facilities to house these systems with significant power and cooling requirements, as well as personnel to maintain and allow best use of the systems. Quest allows Northwestern researchers to share resources, receive computing guidance and support, and collaborate to tackle large-scale research problems they would not have been able to address using existing department-level computing systems. Researchers can translate code they have developed on small computers to these computing clusters, and if necessary, the code can then be ported to even larger-scale national computing centers.

In addition to the new computing facility, the University supports about 50 shared and core facilities
across the two campuses. Within a university, core facilities are vital to the efforts of many researchers. The Northwestern cores provide complex research equipment and technical support for faculty, students, staff, and postdocs. This year two faculty members, Phil Hockberger, physiology, and Teng-Leong Chew, cell and molecular biology, agreed to help further develop and coordinate these facilities. One of the innovations they helped develop is an online searchable database of facilities so researchers can immediately locate resources available on either the Evanston or Chicago campus.

We also share facilities that extend beyond the Northwestern community. For example, through the Chicago Biomedical Consortium, we are involved in the mass spectrometry facility housed at the University of Illinois at Chicago that serves researchers at that institution as well as Northwestern and the University of Chicago. Partnering with other institutions enables Northwestern faculty members to apply for larger grants and justify the purchase of significant research instrumentation.

As our new president saw in his brief tour, the depth and breadth of the research that goes on at Northwestern every day are impressive. In this annual report, we’ve highlighted two areas where the frontiers of knowledge are being stretched: the work of Dave Cella and his colleagues in the new Department of Medical Social Sciences in the Feinberg School of Medicine and the increasing strength of our undergraduate research. We also go up close and personal in our Excellence in Research feature, showcasing 29 faculty members who through their research are creating new knowledge in their various fields.

In closing, let me once more express my gratitude to the faculty, students, postdocs, and staff for the hard work—and passion—they put into the work they do. So often, it seems, our time is spent looking at the bottom line or the number of grants or the major prizes our faculty and students are awarded. And while all of these measures are important, as you would see if you visited directly with our researchers, Northwestern is solving problems that beset society, we are creating new knowledge, and we are positively impacting society. You will see evidence of this in the features that follow.

Sincerely

Vice President for Research
Awards and Recognition

As the title of this annual report—“Creating New Knowledge”—suggests, faculty members generate new knowledge. It is our faculty who perform innovative research; attract, teach, and mentor exceptional students; and engage in activities that benefit and enrich society. While funding levels for sponsored projects provide one clear indicator of the vitality of the University’s research enterprise, the distinction of Northwestern’s faculty is also evidenced by membership in prestigious national academies and societies, awards from the best grant and fellowship programs, citations, and other recognition and honors.

This report focuses on both the financials of research excellence—sponsored project awards, expenditures, and proposals—and on more individual faculty accomplishments during the past year. It also places Northwestern research within a benchmark group of universities. By putting our efforts in a context that considers peer institutions, we are better able to compare University benchmarks for research, which are based on the Consortium on Financing Higher Education (COFHE) groupings. COFHE institutions are private schools that attract a national undergraduate applicant pool and have characteristics in common that permit each school’s inclusion in various cooperative studies.

Members of National Academies and Societies

One of the highest honors for faculty is election to prestigious national academies and societies such as the National Academy of Sciences (NAS), the National Academy of Engineering (NAE), and the Institute of Medicine (IOM). The National Academies perform an unparalleled public service by bringing together committees of experts in all areas of scientific and

National Academy of Sciences Membership with Current Affiliation

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technological endeavor. These experts serve pro bono to address critical national issues and give advice to the federal government and the public.

Two Northwestern professors were elected as fellows of the National Academies in 2009:

Charles Manski, economics, The National Academy of Sciences. Manski, a fellow of the Institute for Policy Research at Northwestern, is an internationally recognized scholar who conducts research that spans econometrics, judgment and decision, and the analysis of social policy.

Chad Mirkin, chemistry, The National Academy of Engineering. Mirkin, director of the International Institute for Nanotechnology at Northwestern, is one of the world’s leaders in the research and application of nanotechnology. In April, Mirkin was named to the President’s Council of Advisors on Science and Technology (PCAST).

CAREER Awards from the National Science Foundation

The Faculty Early Career Development Program (CAREER) Program is the National Science Foundation’s most prestigious award program for new faculty members. The CAREER Award recognizes and supports the early career-development activities of those teacher-scholars who are most likely to become the academic leaders of the 21st century. Twelve Northwestern faculty members were recipients of NSF CAREER Awards in 2009:

Francesco Calegari, mathematics
Robert Findler, electrical engineering and computer science
Darren Gergle, communication studies
Matthew Goldrick, linguistics
Jason Hartline, electrical engineering and computer science
Mitra Hartmann, biomedical engineering
Dean Ho, biomedical engineering
Malcolm Maclver, mechanical engineering
Todd Murphy, mechanical engineering
Brian Odom, physics and astronomy
Regan Thomson, chemistry
Celeste Watkins-Hayes, African-American studies

Institute of Medicine Membership with Current Affiliation

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NSF CAREER Awards

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Source: www.nsf.gov/awardsearch/
With a total of 29 NSF CAREER Awards from 2005 through 2009, Northwestern ranks 5th among its peer universities, up from 8th a year ago.

Citations
Among the nation’s most important researchers are those faculty members whose influence is demonstrated by the citations to their work in the literature of their fields. In this way, their colleagues acknowledge their intellectual debt to these individuals. Researchers who have made fundamental contributions to the advancement of science and technology in recent decades are recognized in this list.

In 2009, 44 Northwestern faculty members appeared on the Institute for Scientific Information list of highly cited researchers. This list is made up of less than one-half of one percent of the more than 5 million researchers indexed in the ISF database. The following Northwestern faculty are among the most-cited researchers worldwide in their respective categories:

James C. Anderson, Economics/Business
Alvin Bayliss, Mathematics
Zdenĕk P. Bažant, Engineering
Ted Belytschko, Engineering
Robert Ogden Bonow, Clinical Medicine
Lawrence J. Christiano, Economics/Business

Stephen H. Davis, Engineering
Greg J. Duncan, Social Sciences, General
*Alice H. Eagly, Psychology/Psychiatry
Martin Stewart Eichenbaum, Economics/Business
Katherine Theresa Faber, Materials Science
Arthur J. Freeman, Physics
Robert J. Gordon, Economics/Business
Ranjay Gulati, Economics/Business
John Hagan, Social Sciences, General
Michael L. Honig, Computer Science
*Yonggang Huang, Engineering
James Arthur Ibers, Chemistry
Leon M. Keer, Engineering
Robert Andrew Lamb, Microbiology
Wing Kam Liu, Engineering
Tobin J. Marks, Chemistry
Thomas O. Mason, Materials Science
Bernard J. Matkowsky, Mathematics
Marcel M. Mesulam, Neuroscience
Richard J. Miller, Neuroscience, Pharmacology
*Chad Mirkin, Chemistry
Jorge Nocedal, Mathematics
Robert H. Porter, Economics/Business
Mark A. Ratner, Chemistry
Martin H. Redish, Social Sciences, General
Sergio Rebelo, Economics/Business
Michael Schmitt, Physics
Robert Schleimer, Immunology
Patricia G. Spear, Microbiology
Jeremiah Stamler, Clinical Medicine
Seth Stein, Geosciences
Allen Taflove, Computer Science
Martin A. Tanner, Mathematics
Peter W. Voorhees, Materials Science
Julia R. Weertman, Materials Science
Michael D. Whinston, Economics/Business
*Steven Mark Wolinsky, Microbiology
Edward J. Zajac, Economics, Business


*New for 2009.
2009 Faculty Recognition and Honors

Each year the president and the provost host a faculty recognition dinner honoring members of the Northwestern faculty who have brought distinction to the University. Northwestern’s Office of Administration and Planning, in conjunction with the faculty honors committee, compiles a comprehensive list of faculty awards and honors. The Faculty Honors Committee then selects those faculty members recognized for the most prestigious honors for University recognition. The following faculty members were honored at the December 9, 2009 faculty recognition dinner for bringing distinction to Northwestern by their important recognition from societies and agencies outside the University in 2008–09:

- **Jan Achenbach**, mechanical engineering, Mindlin Medal, American Society of Engineers
- **Luis Amaral**, chemical and biological engineering, Early Career Scientist, Howard Hughes Medical Institute
- **Guillermo Ameer**, biomedical engineering, Fellow, American Institute for Medical and Biological Engineering
- **Torben G. Andersen**, finance, Member, Econometric Society
- **Zdeněk P. Bažant**, civil and environmental engineering, Nadai Medal, American Society of Mechanical Engineers; Timoshenko Medal, American Society of Mechanical Engineers
- **David H. Bell**, theatre, Award for Choreography, Joseph Jefferson Awards
- **Yuri Berlin**, chemistry, Erasmus Mundus Professorship, European Union
- **Galen V. Bodenhausen**, psychology, Fellow, Society of Experimental Social Psychology
- **Robert O. Bonow**, cardiology, John Phillips Memorial Award, American College of Physicians
- **Laurence O. Booth**, civil and environmental engineering, Member, National Academy for the Arts
- **Ann Bradlow**, linguistics, Fellow, Acoustical Society of America
- **Jason Brickner**, biochemistry, molecular biology, and cell biology, Distinguished Young Scholar in Medical Research Award, W. M. Keck Foundation
- **L. Catherine Brinson**, mechanical engineering, Fellow, American Society of Mechanical Engineers
- **Alan L. Buchman**, medicine, Grace A. Goldsmith Award, American College of Nutrition
- **Christopher P. Bush**, French and Italian, Aldo and Jeanne Scaglione Prize, Modern Language Association
- **Steven G. Calabresi**, law, Bradley Prize, Lynde and Harry Bradley Foundation
- **Francesco D. Calegari**, mathematics, Alfred Sloan Research Fellowship, Alfred P. Sloan Foundation; Faculty Early Career Development Award, National Science Foundation
- **Charles Camic**, sociology, Fellowship, Radcliffe Institute for Advanced Study, Harvard University
- **Jianhua Cang**, neurobiology and physiology, Klingenstein Fellowship Award, The Esther A. and Joseph Klingenstein Fund, Inc.
- **Jian Cao**, mechanical engineering, Associate Member, International Academy for Production Engineering
- **Venkat Chandrasekhar**, physics and astronomy, Fellow, American Physical Society
- **Wei Chen**, mechanical engineering, Fellow, American Society of Mechanical Engineers
- **S. Hollis Clayson**, art history, Fellow, The Clark Art Institute; Frank Hideo Kono Fellowship, The Huntington Library, Art Collections, and Botanic Gardens; Mellon Fellowship, The Huntington Library, Art Collections, and Botanic Gardens
- **Isaac M. Daniel**, civil and environmental engineering, Member, European Academy of Sciences
- **Mark Daskin**, industrial engineering and management sciences, Kimball Medal, Institute for Operations Research and the Management Sciences
- **Penelope L. Deutscher**, philosophy, Fellowship, Alexander von Humboldt Foundation
- **Vinayak P. Dravid**, materials science and engineering, Fellow, Microscopy Society of America
- **James N. Druckman**, political science, Pi Sigma Alpha Award for Best Paper, American Political Science Association
Alice Eagly, psychology, Distinguished Scientific Contribution Award, American Psychological Association; Highly Cited Researcher, Institute for Scientific Information

David M. Engman, pathology, Fellowship, American Academy of Microbiology

Antonio F. Facchetti, chemistry, Research Prize, Italian Chemical Society

Robert Findler, electrical engineering and computer science, Faculty Early Career Development Award, National Science Foundation

Richard Finno, civil and environmental engineering, Karl Terzaghi Award, Geo-Institute Board of Governors

Emmanuel Gdoutos, civil and environmental engineering, Member, European Academy of Sciences; Lazan and Theocaris Awards, Society for Experimental Mechanics of USA

Thomas F. Geraghty, law, Distinguished Public Service Award, Public Interest Law Initiative

Darren Gergle, communication studies, Faculty Early Career Development Award, National Science Foundation

Reginald Gibbons, English, Finalist, National Book Award in Poetry, National Book Foundation; Soeurette Diehl Fraser Award for Literary Translation, Texas Institute of Letters

Rebecca C. Gilman, radio/television/film, Theatre Masters Visionary Award, Aspen Institute

Robert O. Gjerdingen, music studies, Wallace Berry Award, Society for Music Theory

Henry D. Godinez, theatre, Latino Professional of the Year, Chicago Latino Network

Matthew Goldrick, linguistics, Faculty Early Career Development Award, National Science Foundation

John Hagan, sociology, Albert J. Reiss Award for Distinguished Scholarship, American Sociological Association; Best Article Award, Law and Society Association; Michael J. Hinelang Book Award, American Society of Criminology

Eszter Hargittai, communication studies, Best Paper Award, American Sociological Association; Fellow, Berkman Center for Internet and Society, Harvard University

Robert Hariman, communication studies, Diamond Anniversary Award, National Communication Association; Winans-Wichelns Award, National Communication Association

Jason D. Hartline, electrical engineering, Faculty Early Career Development Award, National Science Foundation

Mitra Hartmann, biomedical and mechanical engineering, Faculty Early Career Development Award, National Science Foundation

Aleksandar Hemon, creative writing program, Best Book by a Chicago Author in the Last Year, Chicago Reader; Finalist, National Book Award for Nonfiction, National Book Foundation; National Magazine Award for Fiction, The New Yorker

Dean Ho, biomedical and mechanical engineering, Faculty Early Career Development Award, National Science Foundation

Ian F. Hurd, political science, Myres McDougal Prize, Society of Policy Scientists

Richard Iton, African American studies, Ralph Bunche Award, American Political Science Association

Steven Jacobsen, Earth and planetary science, Presidential Early Career Award for Scientists and Engineers (PECASE); Packard Fellowship for Science and Engineering, David and Lucile Packard Foundation

J. Larry Jameson, dean of Feinberg School of Medicine, Fred Conrad Koch Award, Endocrine Society

Kenneth Janda, political science, Frank J. Goodnow Award, American Political Science Association

Michael C. Jewett, chemical and biological engineering, Pathway to Independence Award in Synthetic Biology Research, National Institute of General Medical Sciences

E. Patrick Johnson, performance studies, Stonewall Book Awards Honor Book, GLBT Round Table of the American Library Association

Vicky Kalogera, physics and astronomy, Fellow, American Physical Society

Stefan Kaufmann, linguistics, Fellowship, American Council of Learned Societies

Sunjay Kaushal, surgery, Early Career Scientist, Howard Hughes Medical Institute
John Kessler, neurology, Peabody Award, University of Georgia
Melina Kibbe, surgery, Presidential Early Career Award for Scientists and Engineers (PECASE)
Mary Kinzie, English, O.B. Hardison Jr. Poetry Prize, Shakespeare Folger Library
Arvind Krishnamurthy, finance, Smith Breeden Prize for Best Paper in Journal of Finance, American Finance Association
Roger A. Kroes, biomedical engineering, Frank A. Beach Comparative Psychology Award, American Psychological Association
Prem Kumar, electrical engineering and computer science, Distinguished Lecturer Award, IEEE Photonics Society
Harold H. Kung, chemical and biological engineering, Ernest W. Thiele Award, American Institute of Chemical Engineers
Ana Kuzmanic, theatre, Joseph Jefferson Award for Costume Design for A Comedy of Errors, Joseph Jefferson Awards
Carol D. Lee, education and social policy, Visiting Scholar, National Education Association
Paul Leonardi, communication program NUQ, Top Paper Award, American Sociological Association
Weiko Lin, radio/television/film, Fulbright Senior Specialist, Fulbright Program
Larry Lipking, English, Emeritus Fellowship, Andrew W. Mellon Foundation
Malcolm MacIver, mechanical engineering, Faculty Early Career Development Award, National Science Foundation
James Mahoney, political science, Best Article Award, American Political Science Association
Charles Manski, economics, Member, National Academy of Sciences
Tobin Marks, chemistry, Fellow, Materials Research Society; Von Hippel Award, Materials Research Society; William H. Nichols Medal, American Chemistry Society
Luciano Marraffini, biochemistry, molecular biology, and cell biology, Nestlé Prize, American Society of Microbiology
Thomas O. Mason, materials science and engineering, Edward C. Henry Award, American Ceramic Society
Leslie J. McCall, sociology, Best Article Award, Socio-Economic Review
David McLean, neurobiology and physiology, Fellowship, Esther A. and Joseph Klingenstein Fund
Douglas L. Medin, psychology, Presidential Citation for Outstanding Contributions, American Psychological Association
Philip B. Messersmith, biomedical engineering, Langmuir Lecture Award, Division of Colloids and Surface Chemistry, American Chemical Society
Marek-Marsel Mesulam, psychiatry and behavioral sciences, Alwyn Lishman Award, International Neuropsychiatric Association
Michael J. Miksis, engineering sciences and applied mathematics, Fellow, Society for Industrial and Applied Mathematics
Chad Mirkin, chemistry, Havinga Medal, University of Leiden in the Netherlands; Lemelson-MIT Prize, Massachusetts Institute of Technology; Member, National Academy of Engineering; Member, President’s Council of Advisors on Science and Technology
Dominic E. Missimi, theatre, Joseph Jefferson Award for Production and Direction of Les Miserables, Joseph Jefferson Awards
Toni-Marie Montgomery, dean, Bienen School of Music, Chicago Area Award, National Association of Negro Musicians
Aldon D. Morris, sociology, Cox-Fraser-Johnson Award, American Sociological Association
Dale T. Mortensen, economics, Distinguished Fellow, American Economics Association
Joseph Moskal, biomedical engineering, Frank A. Beach Comparative Psychology Award, American Psychological Association
Adilson E. Motter, physics and astronomy, Sloan Research Fellowship, Alfred P. Sloan Foundation
Toshio Narahashi, molecular pharmacology and biological chemistry, Distinguished Toxicology Scholar Award, Society of Toxicology
Barbara J. Newman, English, Charles Homer Haskins Medal, Medieval Academy of America; Distinguished Achievement Award, Andrew W. Mellon Foundation
Donald A. Norman, electrical engineering and computer science, Fellow, Design Research Society
Brian Odom, physics and astronomy, Faculty Early Career Development Award, National Science Foundation; Packard Fellowship for Science and Engineering, David and Lucile Packard Foundation; Young Investigator Award, Air Force Office of Scientific Research

Teri Odom, chemistry, Outstanding Young Investigator Award, Materials Research Society

Daniel J. O’Keefe, communication studies, Distinguished Article Award, Health Communication Division, National Communication Association

Paula M. Olszewski-Kubilius, director, Educational Center for Talent Development, Distinguished Scholar Award, National Association for Gifted Children

Marie-Simone Pavlovich, French and Italian, Officer, Ordre des Palmes Academiques, by the French Ministry of Foreign Affairs


Dylan C. Penningroth, history, EBSCOhost America: History and Life Award, Organization of American Historians

Amanda K. Petford-Long, materials science and engineering, Fellow, American Physical Society

Monica Prasad, sociology, Faculty Early Career Development Award, National Science Foundation

Nasrin Qader, French and Italian, New Directions Fellowship, Andrew W. Mellon Foundation

Mark Ratner, chemistry, C. N. R. Rao Prize, Indian Chemical Society; Joseph O. Hirschfelder Prize, University of Wisconsin

Jennifer Richeson, psychology, Distinguished Scientific Award for Early Career Contribution, American Psychological Association

Karen M. Ridge, medicine: pulmonary, Giles F. Filley Memorial Award, American Physiological Society

Todd A. Rosenthal, theatre, Award for Excellence in Design and Collaboration, Michael Merritt Endowment Fund; Laurence Olivier Award, Society of London Theatre

David S. Ruder, law instruction, Lifetime Achievement Award, Fund Directions

John Rudnicki, mechanical engineering, Fellow, American Society of Mechanical Engineering

Marco Ruffini, French and Italian, H. P. Kraus Fellowship, Beinecke Rare Book and Manuscript Library, Yale University

George C. Schatz, chemistry, Fellow, American Chemistry Society; Feynman Prize, Foresight Institute; Peter Debye Award in Physical Chemistry, American Chemical Society

Regina M. Schwartz, English, Fellowship, Institute for Advanced Studies in Culture, University of Virginia

David N. Seidman, materials science and engineering, Turnbull Lecturer, Materials Research Society

Surendra Shah, civil and environmental engineering, Member, Indian National Academy of Engineering

Selim M. Shahriar, electrical engineering and computer science, Fellow, Society of Photo-Optical Instrumentation Engineers (SPIE)

Nitasha Sharma, African American studies and Asian American studies, Named Emerging Scholar, Diverse Education magazine

Kenneth R. Shull, materials science and engineering, Fulbright Senior Scholar Award, Council for International Exchange of Scholars

Richard B. Silverman, chemistry, Perkin Medal, Society of Chemical Industry

Carl Smith, English, Selected Book, Chicago Public Library’s One Book, One Chicago; R. Stanton Avery Distinguished Fellowship, The Huntington Library, Art Collections, and Botanic Garden

Erik J. Sontheimer, biochemistry, molecular biology, and cell biology, Nestlé Prize, American Society of Microbiology

Seth Stein, Earth and planetary science, George P. Wollard Award, Geological Society of America

Margot M. Steinhart, French and Italian, Commandeur, Ordre des Palmes Academiques, French Ministry of Foreign Affairs

J. Fraser Stoddart, chemistry, Honorary Doctorate, Trinity College, Dublin, Ireland

Samuel Stupp, materials science and engineering, Honorary Doctorate, Eindhoven University of Technology in the Netherlands; Fellow, Materials Research Society
Sarah McFarland Taylor, religion, Fellowship for the Young Scholars in American Religion Program, Center for the Study of Religion and American Culture, Indiana University; Best Book on Gender Issues, Catholic Press Association; Best Book on Social Concerns, Catholic Press Association; Senior Research Fellowship, Martin Marty Center Institute for the Advanced Study of Religion, University of Chicago

C. Shad Thaxton, urology, Early Career Scientist, Howard Hughes Medical Institute

Krista Thompson, art history, David C. Driskell Prize, High Museum of Art, Atlanta

Regan Thomson, chemistry, Faculty Early Career Development Award, National Science Foundation

Richard Van Duyne, chemistry, Bomem-Michelson Award, Coblentz Society

Robert Vassar, cell and molecular biology, Potamkin Prize, American Academy of Neurology

Gregory L. Ward, linguistics, Fellow, Linguistic Society of America

Robert L. Warden, associate director, law legal clinic, Cunningham-Carey Award, Illinois Coalition to Abolish the Death Penalty

Celeste M. Watkins-Hayes, African American studies, Faculty Early Career Development Award, National Science Foundation; Health Investigator Award, Robert Wood Johnson Foundation

Sandra Waxman, psychology, Ann L. Brown Award for Excellence in Developmental Research, University of Illinois

Samuel Weber, German and French, Chevalier, Ordre des Palmes Academiques, French Ministry of Foreign Affairs

Emily A. Weiss, chemistry, Young Investigator Award, Air Force Office of Scientific Research

Jessica Winegar, anthropology, Fellowship, American Council of Learned Societies

Michael Wolf, Institute for Healthcare Studies, Pfizer Health Literacy in Advancing Patient Safety Award, National Patient Safety Foundation

Rachel Zuckert, philosophy, Best Monograph Prize, American Society for Aesthetics

### Research Fellowships

Northwestern produced the highest number of U.S. Fulbright students in 2008–2009—32. The University was first overall and first in the grouping of 38 research institutions. In terms of yield, Northwestern (32 awards, 109 applicants) ranked higher than University of Chicago (number two, with 31 awards and 128 applicants) and Brown University (number three, with 29 awards and 106 applicants).

Five students received Gates Fellowships; two were named Rhodes Scholars; and one was awarded a Marshall Scholarship. These are all highly competitive scholarships that provide funding for graduate study abroad.

Northwestern graduate students also fare well in attaining National Science Foundation (NSF) graduate research fellowships. Twenty were awarded NSF Fellowships in 2009, putting Northwestern in the top half of its benchmark cohort of COFHE institutions.

### Northwestern Undergraduate Awards

<table>
<thead>
<tr>
<th>Year</th>
<th>Fulbright</th>
<th>Gates</th>
<th>Rhodes</th>
<th>Marshall</th>
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<td>2009</td>
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<td>5</td>
<td>2</td>
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<td>2008</td>
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<td>2005</td>
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### NSF Graduate Research Fellowships

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<th>Institution</th>
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<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
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<td>Massachusetts Institute of Technology</td>
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<td>77</td>
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<td>Harvard University</td>
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<td>Stanford University</td>
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<td>72</td>
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<td>Cornell University</td>
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<td>19</td>
<td>25</td>
<td>23</td>
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<td>Princeton University</td>
<td>36</td>
<td>28</td>
<td>25</td>
<td>27</td>
<td>28</td>
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<tr>
<td>Northwestern University</td>
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<td>12</td>
<td>16</td>
<td>18</td>
<td>20</td>
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<tr>
<td>Yale University</td>
<td>29</td>
<td>16</td>
<td>15</td>
<td>16</td>
<td>19</td>
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<tr>
<td>Columbia University</td>
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<td>14</td>
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<tr>
<td>University of Chicago</td>
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<td>13</td>
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<td>Johns Hopkins University</td>
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<td>Duke University</td>
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<td>Rice University</td>
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<td>University of Rochester</td>
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</table>

Source: https://www.fastlane.nsf.gov/grfp/AwardeeList.do?method=loadAwardeeList
Excellence in Schools and Programs
Northwestern’s schools and graduate programs generally are ranked highly in “America’s Best Graduate Schools,” published in *U.S. News & World Report*. The following table highlights the Northwestern schools and some programs that recently have been ranked. For a complete listing, visit [www.adminplan.northwestern.edu/ir/data-book](http://www.adminplan.northwestern.edu/ir/data-book).

### Northwestern University Graduate and Professional School Program Rankings

<table>
<thead>
<tr>
<th>School/Program</th>
<th>1994</th>
<th>1999</th>
<th>2004</th>
<th>2008</th>
<th>2009</th>
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<td><strong>Kellogg School of Management</strong></td>
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<tr>
<td>School of Management (Business Week)</td>
<td>2</td>
<td>1</td>
<td>3</td>
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<td><strong>School of Law</strong></td>
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<td>School of Law</td>
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<td><strong>Feinberg School of Medicine</strong></td>
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<td>School of Medicine</td>
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<tr>
<td><strong>School of Education and Social Policy</strong></td>
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<td>School of Education</td>
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<td><strong>McCormick School of Engineering and Applied Science</strong></td>
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<td><strong>Weinberg College of Arts and Sciences</strong></td>
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<td>Chemistry</td>
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<td>Topology</td>
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<td>Psychology</td>
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<td>Political Science</td>
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</tbody>
</table>

1. Rankings are from *US News & World Report* unless otherwise noted.
2. Empty cell denotes no rankings on category in that year.
3. Subcategories/specialties are not ranked each year, though sometimes listed in the current magazine with old rankings.
As a clinical psychologist, David Cella was always interested in measurement.

“Clinical psychologists are trained to test people,” he says. “So I was trained to test and measure. I’d conduct cognitive tests or personality tests. Sometimes I’d test moods or test to assess mental health.”

Sub-specializing in cancer, Cella worked primarily with cancer patients and survivors. And he soon realized that something important was missing in the world of measurement. “There really wasn’t anything appropriate or good out there in terms of measuring how well people with cancer were coping with their illnesses or the treatments,” he says. “Doctors measured whether the tumor shrunk or grew or how long somebody lived, but there were no tools for measuring if these patients were depressed, tired, or able to function.”

Cella began developing a standardized measurement system to gauge quality of life for people who were experiencing or had survived major illnesses. His work turned into the Functional Assessment of Chronic Illness Therapy (FACIT) Measurement System for outcome evaluation in patients with chronic medical conditions. This system is now used worldwide, making Cella a pioneer in the new field of health-related measurement.

Last March, Cella and his measurement science research group found a new home in the Feinberg School of Medicine. Joining Northwestern from NorthShore University HealthSystem (formerly known as Evanston Northwestern Healthcare), Cella is the founding chair of the department of medical social sciences (MSS), which focuses on health measurement, quality of life measures, outcomes science, and statistical tools used to support clinical research. Providing a home base for social science researchers who study health-related issues, the department will include researchers across many disciplines, including psychology, anthropology, economics, and communications.

“We want to recruit scientists who don’t usually find themselves clinically aligned,” says Cella. “For example, you wouldn’t typically find someone from communication sciences in a medical school, but they can tell us a lot about how literacy affects health care.”

Lauren Wakschlag, a developmental translational psychologist, was attracted to MSS by this commitment to interdisciplinary work. She joined the department in February as the associate chair for scientific development and institutional collaboration.

“There are a multiplicity of influences, ranging from socio-cultural context to neural processes, that must be examined in concert in order to clarify their complex intersection in health and disease pathways,” says Wakschlag, who studies early life origins of mental health problems in children. “This requires an approach that propels researchers beyond their traditional content areas and individual lines of inquiry to a boundary-spanning transdisciplinary orientation.”

In her new role, she directs the department’s One Northwestern initiative, which was implemented in fall 2008 to foster collaboration between the biomedical
and life sciences on campus. “When it comes to One Northwestern, we’re really walking the walk,” Cella says. “We’re looking explicitly for talent that comes from other departments or schools.”

One way Cella and his team are building relationships with researchers from diverse areas is by joining the Institute for Policy Research’s Cells to Society (C2S) Center, directed by Lindsay Chase-Lansdale (see page 25). C2S actively integrates social, behavioral, biomedical, and life sciences to discover health inequalities and improve disparities through research.

Although the new department has been on campus for less than a year, the National Institutes of Health (NIH) is already supporting several trans-NIH multidisciplinary measurement initiatives at MSS. Two of those are led by Cella and Richard Gershon, MSS vice chair.

The first is the Patient-Reported Outcomes Measurement Information System (PROMIS) Technical Center, a new computerized tool for measuring symptoms that are typically difficult to quantify, such as pain and fatigue, in patients with chronic diseases and conditions. Using their home computers, patients can access this free, online resource, which leads them through a series of questions designed to measure physical suffering and emotional well-being.

One main goal of PROMIS is to establish a common language for researchers at different institutions. “In the past different institutions would use their own measures for fatigue. It was impossible to compare,” says Gershon. “We’re developing a single set of measures so we’re all speaking the same language.”

The second project is the NIH Toolbox. Unlike PROMIS, the NIH Toolbox is designed to be used with
healthy populations to determine if different levels of functioning are predictive of illnesses later in life. Again, the purpose is to create uniformity among measures — this time for assessing neurological function and behavioral health.

Gershon notes that a striking component of both projects is how accessible and affordable they are for researchers and patients. “Using automation is both highly accurate and inexpensive,” he says. “Right now, the world of health assessment is wide open, and automation will drastically improve the field.”

In developing these common measurements, the ultimate goal is to improve treatments for patients. Cella says that measuring a patient’s emotional condition is just as important as measuring his or her physical condition during a clinical trial for a new treatment. “We don’t necessarily know that it’s a better life just because the disease improved,” he says. “The treatment might have side effects that are worse than the illness. It’s important to keep in mind that we are treating an actual person who may or may not see things the same way as a laboratory scientist or doctor.”

Cella expects to have a faculty of approximately 20 members recruited by the end of 2010, with the goal of having a defined educational initiative set by March 2012.

—By Amanda Morris

Instant Department: How OSR Helped Set Up MSS

When David Cella came to Northwestern from NorthShore University HealthSystem, he brought more than 70 grant proposals and industrial contracts as well as 50 staff members to form the department of medical social sciences (MSS) at the Feinberg School of Medicine. It was enough to make the Office for Sponsored Research (OSR) in Chicago work overtime.

“We have this sort of activity all the time, but it’s diffused throughout the year,” says Bruce Elliott, director of OSR in Chicago. “This came so suddenly. It was an instant department out of nowhere.”

When new faculty members join Northwestern, it is the responsibility of OSR to make sure that all grants are transferred. OSR also sets up pre-spending accounts to allow new faculty to start spending on a project while the grant is still being transferred. In Cella’s case, there were also multiple industrial agreements that had to be negotiated to maintain Northwestern’s research mission.

The workload caused Elliott to obtain funding for an extra senior contract and grant officer position in OSR and to shift workloads on the grants side of the office to provide the additional services for MSS. These changes were partially motivated by the fact that the new department was being established as deadlines approached for proposals for the American Recovery and Reinvestment Act (ARRA).

“Being that busy was unprecedented. It will never happen again to that extent,” Elliott says. “There was a certain excitement to it. All of the other OSR offices across the country were also handling the ARRA workload, so there was a bit of camaraderie there.”

Still, Elliott says the work associated with setting up the new department would have been challenging without the ARRA deadlines due to the suddenness of volume and complexity of the industrial agreements Cella brought with him. “Being able to handle all of this is a reflection of the staff,” says Elliott. “They had an unrelenting workload for four months this spring and deserve all the credit for making this a success.”
Undergraduates Develop Basic Research Skills

The average age for new investigators when they receive their first funding from the National Institutes of Health has increased to 41.7 for PhDs and 43.2 for MDs, according to the National Institutes of Health. What if researchers started learning the fundamentals of sponsored research at an earlier age? Would that help jump start research careers?

No one can answer these questions yet, but Northwestern’s Undergraduate Research Grant Program is ensuring that Northwestern undergraduates have the opportunity to acquire basic research skills. The program, sponsored by the Provost’s Office, has been in existence for more than 10 years.

Between 2002 and 2008 the number of undergraduate students participating in sponsored research essentially tripled, and the funding awarded for sponsored research by undergraduates more than doubled. By 2008 close to 500 undergraduates had participated in sponsored research projects at funding levels of almost $750,000. In the 2008-2009 academic year Northwestern undergraduates engaged in research received close to $1.5 million from the Provost’s Office, individual Northwestern schools, the Office of Residential Colleges, and sponsored research, estimated Ronald Braeutigam, associate provost for undergraduate education.

Research opportunities take many forms, involve students in just about every discipline, and take place on campus and at locations across the country and in distant parts of the globe. Of the 83 summer projects funded last year by the Undergraduate Research Grant Program, more than a dozen were international in scope, taking students, among other places, to Poland, Argentina, and Uganda.

Presenting Student Research

Many students present the results of their research at the end of the academic year in the Undergraduate Research Symposium. More than 160 students presented at last year’s symposium in poster sessions, paper sessions, and, for the first time, in creative arts performances. This year’s symposium will be held May 24 in the Norris University Center and is free and open to the public.

The emphasis on undergraduate research makes Northwestern an excellent training ground for
• For more than a decade, the Institute for Policy Research has offered undergraduates the chance to conduct social science research as research assistants to faculty fellows. Open to freshmen, sophomores, and juniors, the program begins with training in the basics of statistical methods and software.

• Since 1998 the Office of Residential Colleges has operated the Fellow Assistant Research Award Program, which matches affiliated faculty with paid undergraduate research assistants. The popular program receives more faculty proposals than it can accommodate. This year, with $33,000 in support, 20 undergraduates are assisting faculty in their research.

• Staff in the Provost’s Office and the Office of Fellowships work closely with students on undergraduate research proposal development. They provide advice on projects, help students narrow their focus, and discuss methodology. “There’s a real teaching element involved,” says Jana Measells, coordinator of the Undergraduate Research Grant Program. “Learning to develop a research proposal was something I didn’t learn until I was three years into graduate school.”

Facts about Undergraduate Research:

• More than 75 percent of undergraduates in the Robert R. McCormick School of Engineering and Applied Science spend one or more quarters doing significant on-campus research.

• In 2008–09 the Judd A. and Marjorie Weinberg College of Arts and Sciences provided just over $200,000 in research grants to more than 80 undergraduates.

• The Medill School of Journalism’s Eric Lund Global Reporting and Research Grant Fund supports students pursuing projects in underreported parts of the world, such as Asia, Latin America, and Africa.

• The School of Communication provides grants to undergraduates pursuing projects of their own design. In addition, the school’s Innovation Grants encourage faculty members to involve students in their research.

• The School of Education and Social Policy, which offers Alfred Hess Grants to undergraduates pursuing research, holds a yearly undergraduate research symposium highlighting student research from all Northwestern schools.

— Adapted from a Northwestern University news release by Wendy Leopold

Fulbright Scholarships and other external grants. For example, 32 Northwestern students received Fulbright awards in 2008–09; that number represented the highest number and percentage of submissions among all U.S. universities. See page 14 for a tally of prestigious Northwestern undergraduate fellowship awards.
Scott A. Barnett  
McCormick School of Engineering and Applied Science

New Methods for Imaging Fuel Cells

Solid-oxide fuel cells offer an important new option for converting fuels to electricity with increased efficiency, decreased pollution, and reduced greenhouse gas emissions. The race to reap the commercial and environmental benefits of this technology is largely being decided by practical issues, including cost and device reliability. Scott Barnett, materials science and engineering, and his research team seek to better understand how solid-oxide fuel cell performance and reliability are linked to manufacturing methods and constituent materials properties by acquiring and analyzing three-dimensional microscopic images of the fuel cells.

Such images can be used to determine what structures yield improved performance (and hence reduced cost), find manufacturing conditions that yield the desired structure/chemistry, and examine the factors causing fuel cells to degrade over time. In this project Barnett and his team are focusing on characterizing fuel cell electrodes, both anodes and cathodes. The image shown above left illustrates the morphology of the nickel (Ni) phase in a porous nickel-zirconium-oxygen (Ni-ZrO₂) composite, commonly used as the anode (fuel electrode) in solid-oxide fuel cells.

This structural information is providing new insights into the electrochemical performance of these electrodes and the fuel cell as a whole. Further, it is allowing researchers to gain a greater understanding of the fuel cell’s long-term endurance. The resulting reductions in cost and improvements in device lifetime should help speed the widespread introduction of fuel cell power plants. Barnett’s research will include fundamental studies to determine and understand the properties of the new anode and cathode materials, as well as fabrication and electrical testing of solid-oxide fuel cells with the new materials.
Fracture surfaces of synthetic nanocomposite with 0.5wt% single walled carbon nanotubes in polymethylmethacrylate (plexiglass). Tortuous, interlocking nanotubes percolate through the sample providing electrical conductivity and dramatically altering thermal and mechanical properties of the host polymer.

L. Catherine Brinson
McCormick School of Engineering and
Applied Science

Enabling New Kinds of Nanocomposites, Implants, and Sensors

Cate Brinson, mechanical engineering and materials science and engineering, conducts research in advanced material systems, crossing the boundaries between the underlying material physics and the mathematical mechanics descriptions of their behaviors. The advanced materials she studies are typically multiphase, hierarchical systems, requiring understanding of mechanisms across many length and time scales.

Brinson’s work involves materials such as bone and advanced synthetic nanomaterials. While polymers with nanotubes and natural bone may seem extraordinarily different, she points out striking similarities. “Bone is a natural viscoelastic composite, composed of stiff nanocrystals bound in a soft collagen matrix,” she says. “This is very like the nanocomposites we synthesize with stiff graphene nanoplates bound in a softer polymer matrix material.” Her research group performs experiments and modeling to elucidate the interconnected response mechanisms from the nanometer length scale up to the structural level. This work helps enable new kinds of bone implants, sensors, and tailored nanocomposites. Work published in *Nature Nanotechnology* in 2008 by Brinson’s group demonstrated an unprecedented increase in stiffness and thermal resistance in nanocomposites by including only 0.05 percent of graphene nanosheets in a polymer.

The success of these future applications increasingly hinge upon intelligent tailoring of small-scale architectures using polymers in small domains and at interfaces. This work demands a deep understanding of local polymer properties altered by interactions and constraints from surfaces. Brinson is developing a rigorous method to probe properties of materials via nanoindentation coupled with modeling where current size effects prohibit results. Her analysis approach can be extended to biological samples, with many of the same features and concerns, where small-scale mechanics are increasingly discovered to play critical roles in biological properties and function.

Brinson recently co-authored a new book, titled *Polymer Engineering Science and Viscoelasticity: An Introduction*, with her father, Hal Brinson. Cate and her father, a recently retired mechanical engineering professor from the University of Houston, had talked about writing a book together for some time. Both taught advanced courses in polymers and viscoelasticity and shared notes, and since Hal had always wanted to create a book out of his notes, why not do it together?

“It’s very interesting because it’s multigenerational,” Cate Brinson says. “Terminology changes over time and we would sometimes get into arguments about how you’re supposed to explain a concept. And then it would turn out that we’re both right.” That gives the text both historical and modern viewpoints, Cate Brinson says.
Paul Bryce  
Feinberg School of Medicine

Developing Immunotherapy for Food Allergy

Prior to arriving at Northwestern, Paul Bryce, allergy-immunology, had mainly focused his research on asthma and eczema, as does the majority of the allergy research community. Through support from the Food Allergy Project, founded in 2006 by Denise and David Bunning, Chicago-area parents of two young boys who have struggled with life-threatening food allergies since infancy, the Bunning Food Allergy Institute and Robert Schleimer, chief of the allergy immunology department at Northwestern, offered Bryce a unique opportunity to join him at Northwestern. The offer came with one stipulation: researching food allergy.

Bryce had no trouble accepting the stipulation as his wife is allergic to fish, shellfish, and tree nuts and he knew how disruptive a food allergy can be. For patients with food allergy, treatments are limited, with avoidance being the main option. Immunotherapy, which can be very successful for patients with asthma or hay fever, is not usually possible for people with food allergies because of the risk for severe, life-threatening reactions.

Once he had absorbed the research literature on food allergy, Bryce realized that the field lacked a strong animal model that allowed researchers to tackle the types of mechanistic questions that had moved asthma research forward. He and his research team set about trying to develop a new model for food allergy, which they reported in the *Journal of Allergy and Clinical Immunology* (January 2009). They were very excited when the National Institutes of Health (NIH) issued a food allergy-focused press release (January 2009) that highlighted their research. The NIH then issued a call for proposals that focused on food allergy, and the Bryce research team successfully obtained support. The team has since obtained additional support from the Food Allergy Initiative to investigate a new approach to inducing immunotherapy in collaboration with Stephen Miller, microbiology and immunology.

Bryce sees potential in exploring the mechanisms relating to food allergy and anaphylaxis as well as possible new therapies. He has developed a team of young graduate students and postdoctoral scientists who are committing their careers to food allergy–related science and will continue to develop the field of food allergy research.

Mast cells are important in triggering anaphylaxis. Paul Bryce and his team study them to understand how the mediators they store (left) and release on activation (right) influence food allergy responses.
Mercedes R. Carnethon  
Feinberg School of Medicine

Connecting Diabetes with Other Diseases

The world-wide obesity epidemic is responsible for reversing many of the declines in cardiovascular disease mortality experienced over previous decades. Type 2 diabetes, a common complication of obesity and an established risk factor for cardiovascular disease, is the focus of the research of Mercedes Carnethon, preventive medicine and faculty associate in the Institute for Policy Research. As an observational epidemiologist, Carnethon studies the distribution of type 2 diabetes in the population and tests whether certain health behaviors or disease processes occur more often among those who develop diabetes as compared with those who do not.

Type 2 (adult-onset) diabetes is a complex disease that develops in response to a number of genetic, physiological, behavioral, psychological, and environmental “insults.” Carnethon has studied factors associated with the development of diabetes from each of these systems. Beginning with an NIH career development award in 2003, Carnethon has demonstrated in a number of population settings an imbalance between the sympathetic ("fight or flight") and parasympathetic ("relaxation") divisions of the autonomic nervous system associated with the development of diabetes. Autonomic imbalance is a plausible mechanistic process explaining higher rates of diabetes in persons who are less physically active, have poor diets, sleep less, or are experiencing depressive symptoms or higher levels of psychosocial stress than their counterparts.

Carnethon was recently funded by the National Heart, Lung, and Blood Institute to test whether short sleep duration in otherwise healthy adults is associated with autonomic imbalance and other disease-causing processes. She is testing her hypothesis in a population of healthy adults recruited from the Chicago area. Findings from her research will identify mechanisms to explain earlier observations that people who sleep less are more likely to develop diabetes and cardiovascular disease.
The persistence of poverty in the United States—and in particular, child poverty—is a problem that continues to challenge policymakers, researchers, and advocates alike.

After a decade of decline, the proportion of young children living in low-income families rose 15 percent between 2000 and 2007, with almost two-thirds living with parents who have earned a high school diploma or less. Without postsecondary credentials, few of these families will experience upward economic mobility.

P. Lindsay Chase-Lansdale, human development and social policy and Institute for Policy Research (IPR), has examined the problem of economic hardship from many angles—from her groundbreaking work in Welfare, Children, and Families: A Three-City Study to her more recent role in bridging the medical and social sciences as founding director of Cells to Society (C2S): The Center on Social Disparities and Health at IPR. Yet her perspective has remained the same: to examine social problems through a multidisciplinary lens.

“Poor children live in—and are shaped by—their experiences as members of low-income families and communities,” she says. “Yet early childhood interventions rarely target education and employment opportunities for parents.”

As one of the lead researchers working on a large postsecondary education initiative spearheaded by the Bill & Melinda Gates Foundation, Chase-Lansdale is bringing that broad perspective to bear. The Gates initiative seeks to double the number of low-income students between the ages of 18 and 26 who earn college degrees or training certificates by 2025. Chase-Lansdale and her colleagues are taking a novel approach to helping low-income parents by using high-quality early childhood education centers as the platform for adult education and workforce interventions.

In collaboration with the Ounce of Prevention Fund and Jeanne Brooks-Gunn of Columbia University, Chase-Lansdale has completed a pilot study of low-income mothers of very young children in Educare preschools in Chicago, Denver, and Miami. Their long-term goal is to launch a randomized trial of a model intervention that simultaneously addresses the needs of young children and their parents.

“We so often target the child as the agent of change,” Chase-Lansdale says. “But the child cannot be the only change agent in a family or community of economic hardship. We need two-generation interventions.”

P. Lindsay Chase-Lansdale
School of Education and Social Policy
and Institute for Policy Research

Breaking the Cycle of Poverty

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Drew Edward Davies
Bienen School of Music

Early Church Music: A Multicontinental Phenomenon

Drew Edward Davies, musicology, studies the music and cultures of New Spain (viceregal Mexico) from the 16th to the 18th centuries. An overlooked area of early music scholarship, Latin America preserves a vast repertoire of church music crafted in European styles that remains misunderstood by scholars and the general public alike. Although it may sound like Spanish or Italian music, New Spanish music encodes colonial iniquities and exemplifies the rhetorical strategies of the Catholic Church.

Davies has been instrumental in preserving, reviving and reassessing this musical repertoire in Mexico. Granted unprecedented access to the archive of Durango Cathedral, Davies organized and cataloged the cathedral’s entire 836-work collection of 18th-century manuscripts according to international criteria—the only such project completed to date in Spanish America. He now serves as an adviser on similar projects in Mexico City and Guadalajara.

At Durango, Davies discovered the compositions of Santiago Billoni, a heretofore-unknown Roman composer of the 1740s who wrote progressive music with virtuosic violin parts. Davies’s editions of some of these works have been featured in revelatory concerts by the Northwestern University Early Music Ensemble, the Newberry Consort, Baroque Band, Early Music New York, and the Dallas-based Orchestra of New Spain.

In his upcoming monograph *Music and Devotion in New Spain* (Oxford University Press), Davies asserts that New Spanish music must be understood in transatlantic contexts, and by drawing upon interdisciplinary approaches, he reassesses fundamental aspects of the field. For example, he shows that 17th-century villancicos (religious poems in Spanish set to music for church services) with Afro-Hispanic texts do not illustrate the musical cultures of African groups in New Spain, as generally assumed, but rather serve as religious allegories that represent fictive Africans that behave according to ecclesiastical ideals. Davies argues that New Spanish musical culture remained synchronic with musical practices in Europe, not a generation behind as had been previously understood. In addition, he was the first scholar to recognize the currency in Mexico of the galant style, which favored simplified harmonic language and lyrical melody. Through Davies’s efforts, the intellectual and performance communities are beginning to re-envision early music as a multicontinental phenomenon that moved far beyond the cities, courts, and churches of Europe.

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Antonio de Salazar (c.1650–1715) *Señas ve claras*, villancico for the Virgin of Guadalupe, continuo. Archivo de Música del Cabildo Catedral Metropolitano de México, A0047. Davies edited this manuscript, which has a unique text referring directly to Mexico City, as visible in the incipit “Al mexicano sitio.”
James N. Druckman  
Weinberg College of Arts and Sciences and Institute for Policy Research

**Processing Political Information**

Most people spend little time thinking about politics. If asked, they could not offer details about health care or energy policy or about the latest foreign policy initiatives. Moreover, much of what people do know comes from what politicians and the news media tell them. This creates a dilemma for democracies: governing officials are supposed to implement policies that reflect citizens’ preferences, but these preferences are often ill-formed and driven by elites (e.g., elected officials, news outlets). Untangling this dilemma—how elites present policies, how citizens form political opinions, and how elites then respond—is the research topic of James Druckman, political science and Institute for Policy Research.

Druckman analyzes the content of elite messages (e.g., public statements, websites, media coverage), uses surveys and experiments to investigate public opinion formation, and exploits presidential archives to explore responsiveness to those opinions. Central to his work is the idea of framing. An alternative energy plan, for example, can be framed in terms of costly economic effects or beneficial environmental outcomes. When it comes to politics, elites talk and citizens think, first and foremost, in terms of frames. For example, if citizens think of alternative energy mostly in terms of its economic rather than environmental consequences, they are likely to oppose the policy. Importantly, once citizens form their opinions, they often interpret subsequent information in a biased fashion. Economically oriented citizens might dismiss facts about environmental consequences as baseless, even if they are objectively sound.

As a result, citizens base opinions on frames received from the very elites who are supposed to respond to those opinions. Citizens then often reject contrary perspectives, even those with ostensible merit. Druckman’s research (which has been funded by the National Science Foundation, the Russell Sage Foundation, and the McKnight Foundation) suggests the best way to avoid this situation is not to provide—as many suggest—more and more factual information. Instead, the key is to take steps to motivate citizens to accurately process information (e.g., via reminders to try to form “objective” opinions) and ensure exposure to alternative portrayals of policies.
Andrea Dunaif
Feinberg School of Medicine

Research Links Polycystic Ovary Syndrome with Diabetes

Research being conducted by Andrea Dunaif, endocrinology, metabolism, and molecular medicine, focuses on reproductive physiology and metabolism in women. She is an internationally recognized expert on polycystic ovary syndrome (PCOS), the most common endocrine disorder in premenopausal women. Her research has led the way in redefining PCOS as a serious metabolic disorder that affects women across their lifespan and in revolutionizing its treatment with insulin-sensitizing drugs.

Dunaif was the first to demonstrate that women with PCOS are at markedly increased risk for type 2 diabetes and that this risk was the result of profound peripheral insulin resistance. These abnormalities have become part of the biochemical hallmarks of PCOS. Her research on the mechanisms of the association between hyperandrogenism (overproduction of androgens, which control the development and maintenance of masculine characteristics) and hyperinsulinemia (high levels of insulin in the blood) led directly to novel therapy for the disorder with insulin-sensitizing drugs.

Dunaif has been at the forefront of elucidating the etiology of PCOS. She has shown that PCOS is a complex genetic disease and that male as well as female first-degree relatives have both reproductive and metabolic abnormalities. Indeed, she has shown that first-degree relatives are at risk for diabetes and heart disease, substantially amplifying the public health impact of PCOS.

Her investigative team has applied state-of-the-art techniques for mapping genetic susceptibility loci. This research has led to the identification of a major PCOS susceptibility genetic locus on chromosome 19p13.2. Moreover, these studies argue that hyperandrogenemia plays an important primary role in the pathogenesis of metabolic defects, perhaps through prenatal programming. The team is currently conducting a genome-wide association study to identify additional PCOS-susceptibility genes, a project funded in part by an ARRA grant through the National Institutes of Health.

Analysis of chromosome 19p 13.2 in the families of women with polycystic ovary syndrome. The marker, D19S884, with the strongest evidence for linkage and association with polycystic ovary syndrome maps to an intron of the fibrillin-3 (FBN3) gene. Urbanek, et al., Journal of Clinical Endocrinology & Metabolism 92: 4191–4198, 2007.
Darren Gergle
School of Communication

Advancing Collaborative Technologies

As recent efforts in telemedicine, distance education, and remote training attest, enormous potential exists for novel technologies to support remote collaboration. Their successful creation, deployment, and use can have widespread societal benefits such as equal access to high-quality education and medical care.

Darren Gergle, communication studies and electrical engineering and computer science, has been studying and developing the next generation of collaborative technologies. His work has pioneered advances in our understanding of remote collaboration in visually situated environments.

Gergle’s research has addressed a central challenge in multimodal collaborative systems: understanding how visual context modulates the meaning of particular linguistic forms. His work reveals that the distribution of deixis (e.g., “this/here” vs. “that/there”) varies depending on the perceived proximity of interlocutors, and speakers generate simpler language in contexts where visible actions accompany speech. In one recent study, results showed that something as straightforward as computer display size can influence cognitive perspective and feelings of presence, which drastically influence language use and ultimately impact collaborative performance in a virtual environment. These findings reveal that inferences about a collaborator’s goals, focus of attention, level of comprehension, shared knowledge, and the state of the joint task all derive from shared visual context—or lack thereof—and have implications for collaborative applications ranging from telesurgery and education to interactive museum experiences.

In new research funded by an NSF Faculty Early Career Development (CAREER) award, Gergle and his graduate students are developing mobile tracking techniques, such as a novel dual eye-tracking paradigm with automatic object detection, in order to support the construction of richer, more realistic computational models of collaborative interaction. In addition to this award, Gergle’s research has been generously supported by grants from the NSF and Microsoft Research.

A novel mobile eye tracking prototype that outputs raw eye-tracking data (middle images) and converts it into a form that detects and shows what an individual is looking at (green objects in far right images) and what other objects are in his or her field of view (red objects) in far right image. Photos on this page courtesy of Darren Gergle.
Godinez directed seniors Elly Lachman and Kevin Fugaro in the Northwestern production of *The Sins of Sor Juana*. Lachman and Fugaro will participate as understudies in the production at the Goodman.

**Henry Godinez**  
School of Communication

**Latino Theatre: Celebrating the Universality of Being Human**

In 1990 Henry Godinez, theatre, became cofounder and artistic director of a company of young Latino theater artists committed to producing new plays by gifted Latino playwrights that “mainstream” theaters were unwilling to take a chance on producing. At the same time they were creating opportunities for Latino actors to perform roles that reflected their experiences. They called themselves Teatro Vista, theater with a view.

Looking to bridge the cultural gap, the company’s goal was to build a diverse audience. In 1994, when he discovered that the Goodman Theatre had received a large grant to diversify its audiences, Godinez saw an opportunity and approached the theater about doing a coproduction.

Fifteen years later, that relationship is still bearing fruit. Godinez is now resident artistic associate at the Goodman and director of its biennial Latino Theatre Festival. “I travel throughout Spain and Latin America looking for artists who expand our notions of what theater can be,” Godinez says. “The Goodman really champions the work of international, national, and local Latino artists.”

The 2010 Latino Theatre Festival—the Goodman’s fifth—has an exciting lineup, including a collaboration with a company in New York City that fosters translations of new Spanish-language plays and a reading of an original script adapted by Northwestern students to celebrate the centennial of the Mexican Revolution. The festival is also working to bring a theater company from Cuba to perform in the United States for the first time.

The centerpiece of the festival, though, will be the Goodman staging of *The Sins of Sor Juana*, which opens June 28. It is the story of Sor Juana Inez de la Cruz, a 17th-century Mexican writer whose plays and poetry expressed a feminism centuries ahead of its time. Godinez first staged the show with students at Northwestern’s Theatre and Interpretation Center last winter. He’ll direct again, with several Northwestern students continuing to be involved with the Goodman production. “Part of what I do as a professor is create avenues into the profession for our students, and it’s good for all of us,” Godinez says.
Kristian Hammond
McCormick School of Engineering and Applied Science

Getting You the Information Before You Know You Need It

Kristian Hammond, electrical engineering and computer science, says that the focus of his research is information. In particular, getting people to the information they need, the information they want, in the moment right before they know they need it. It might be getting someone the recipe for a dish as they watch a video of someone making it. Or even getting the status of a Cubs game as it is happening to someone who just tweeted about it.

In order to do this work, computer systems need to be able to do three things. First, they have to be able to know what it is you are doing. Second, they then need to figure out what might be helpful to you. And third, they need to figure out how to find it. It all comes down to understanding people and their needs and how computers can help meet them.

Hammond says it’s necessary to start thinking not just about finding things, but also about building them—that is, synthesizing documents and experiences aimed at the specific interests a person has at a particular moment. This work has led to what is called machine-generated content: content that did not even exist until the machine realized that you might need it.

Hammond’s main example of machine-generated content is News at Seven, a system he created with two Northwestern graduate students that creates a news show with anchors, video, animations, and even witty banter based upon a person’s interests. More recently, he and students at McCormick’s Intelligent Information Lab and the Medill School of Journalism have created StatsMonkey, a system that generates stories based on the raw numerical data associated with a baseball game. Both of these systems create something new out of what they are able to find online.

Hammond sees a world of information that is entirely frictionless, where information flows to you based upon your needs. No matter where you are, what you are doing, or what you are thinking, computers will get you what you want and what you need.
Understanding Digital Diversity

The American Recovery and Reinvestment Act of 2009—more commonly referred to as the stimulus package—includes billions of dollars for wiring the nation with broadband infrastructure to ensure that all Americans have access to the Internet. But does such a solely technical solution resolve the potential inequalities that may result from inequitable access to the Internet? Eszter Hargittai, communication studies and faculty associate in Institute for Policy Research, has been addressing questions such as this one in her research for the past decade. With funding from agencies like the John D. and Catherine T. MacArthur Foundation and the NSF, she has been collecting data to look at how people’s digital media uses differ across population segments.

Her findings suggest that there are considerable differences in how people use the Internet even once basic access to the medium is accounted for. That is, crossing the so-called “digital divide”—the differences between the haves and have-nots—does not in and of itself address concerns about digital inequality. Rather, being skilled in using the Internet is an additional important component of how people integrate the Internet into their lives. Through survey data collected on different population segments, Hargittai has consistently found that people from more privileged socioeconomic backgrounds are more skilled in using the Web than others. Higher skills then relate to engaging in more diverse activities online, which can be linked to more potential ways of benefiting from the medium.

Through her unique data, Hargittai has been able to show that divergent online behaviors cannot simply be explained by variations in personal interests and motivation. Rather, skill and the social context of where people use the Internet are important correlates of different usage patterns. While it is discouraging to note that the Internet may be reproducing existing social inequalities, the upside of these findings is that through training, education, and social support, people’s online skills may be improved. Consequently, as long as the social dimensions of use are taken into account, the Internet still holds the potential to contribute positively to the well-being of people from across the socioeconomic spectrum.
William L. Kath, engineering sciences and applied mathematics, is codirector of the Northwestern Institute on Complex Systems (NICO). His research area is the mathematical modeling of engineered, physical, and biological systems. One topic of interest is the use of computational models of neurons and networks of neurons to explore the processing of information in the hippocampus, an area of the brain responsible for the formation of memories. Working with Nelson Spruston, neurobiology and physiology, he has used computational models both to help explain the meaning of the Spruston lab’s experimental results and to devise new hypotheses that can be tested experimentally.

One subject of their collaboration has been a study of the ion channels present in the membranes of neurons. When activated, these proteins open a pore in the cell membrane, allowing ions to flow. This causes an action potential, which propagates along axons to other neurons, producing chains of activity that carry information within the brain. Simulating how this neural activity spreads requires proper modeling of the activation of the ion channels. Kath and colleagues recently took a cue from nature and used computational evolutionary algorithms to do this. Along with graduate student Vilas Menon, they made 100 models with many different parameters. Those models were then simulated on a computer, and the results were compared with the experimental data to see how well they matched. By keeping the best traits from different models and recombining (breeding) them, a model was obtained after thousands of generations that properly matched the real thing. Others have used such “genetic” algorithms before, but Kath and colleagues introduced a new twist: they allowed the overall structure of the model to be “mutated” during breeding. This produced unexpectedly simple models matching the data. These results were recently published in Proceedings of the National Academy of Sciences.

An evolutionary algorithm searches automatically through millions of mutated state-dependent model topologies and parameter sets to find the best computational representation of a sodium channel. The final model matches data from experimental protocols spanning multiple time scales, and when used in simulations of pyramidal neurons, reproduces activity-dependent behavior seen experimentally.
What Are the Causes of Financial Crises?

If we had a precise understanding of financial crises, regulators such as the Federal Reserve as well as private investors would be better able to manage the risk of crises, thereby forestalling their deleterious consequences, says Arvind Krishnamurthy, finance. He argues that the rapid adoption of financial innovations—the growth of subprime and other asset-backed securities, for example, in the recent crisis—is an important factor that sets the stage for a crisis.

His study, coauthored by Ricardo J. Caballero of the Massachusetts Institute of Technology and appearing in the American Finance Association’s Journal of Finance, looks at three of the deepest liquidity crises of the last 40 years: the 1970 default by Penn Central Railroad, the stock market crash of October 19, 1987, and the collapse of the Long Term Capital Management hedge fund in 1998. In each of these events, the trigger for the crisis was the unexpected behavior of a new aspect of the financial market. Krishnamurthy argues in his paper that when new instruments behave in unexpected ways, investors grow uncertain of their investments and models, disengaging from the market while going back to the drawing board. However, this behavior causes a loss of liquidity and can spiral into a financial crisis.

Krishnamurthy’s research offers some lessons for investors and policymakers. For example, investors learned from painful liquidity crises and improved their methods of handling risk. They acquired a better understanding of how financial innovations behaved—knowledge that protected the financial system during later, similar events. Thus the 1997 Mercury Finance commercial paper default, the October 13, 1989, stock market drop, and the 2006 collapse of the Amaranth hedge fund caused little liquidity disruption.

His study also highlights the importance of swift action by the central bank. He argues that in a crisis driven by uncertainty, the lending of the central bank provides a backstop for markets. The central bank provides “certainty” and gives investors time to sort things out. Finally, the study has implications for regulatory reform. It suggests that regulators worried about systemic risk should limit the proliferation of new financial products until investors have enough experience with them to understand how they work.

Arvind Krishnamurthy
Kellogg School of Management

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Role of the Liver in Cardiac Protection

The liver contains a large reserve of cells capable of regenerating when the organ is injured. Shu Q. Liu, biomedical engineering, and his research team have discovered that the liver cells also may contribute to the protection of the heart against ischemic injury caused by the obstruction of blood supply. Myocardial ischemia can lead to myocardial infarction, which can damage the heart, reducing its ability to function.

While adult heart muscle cells (cardiomyocytes) possess a limited capacity for self-protection and regeneration, other cells can be activated to support the survival and performance of the damaged myocardium, the muscles that surround and power the heart. Liu and colleagues recently discovered that liver cells can be activated in response to myocardial ischemia in the mouse to express a number of genes encoding secreted proteins. These proteins include bone morphogenetic protein binding endothelial regulator (BMPER; fig. e) and fibroblast growth factor 21 (FGF21). Liu’s research team found that administration of either BMPER or FGF21 significantly reduced acute myocardial infarction in the mouse model of myocardial ischemia. These factors potentially may be used as therapeutic agents for alleviating ischemic myocardial injury.

The team has further discovered that liver cells, including hepatocytes and biliary epithelial cells, can be mobilized to the circulatory system in response to myocardial ischemia (figs. b and c). This process is brought about by leukocyte (white blood cell) retention and the release of matrix metalloproteinase-2 in liver tissue. Mobilized liver cells can engraft to the lesion of ischemic myocardium and release myocardial injury-alleviating factors. Liver cells often are recruited to the peripheral region of ischemic myocardium, where partially injured muscle cells can be rescued (fig. d). This process demonstrates a naturally developed mechanism of targeted delivery of cell-protecting factors in myocardial ischemia.

This research may contribute to the development of myocardial injury-alleviating agents based on liver cell–secreted factors activated in response to myocardial ischemia. Liu’s work is supported by the NSF and the American Heart Association.

Shu Q. Liu
McCormick School of Engineering and Applied Science

a. Myocardial ischemia; b. Liver cell mobilization; c. Circulating liver cells (green); d. Liver cell engraftment to ischemic myocardium; e. Myocardial protective effect of BMPER.
At Heart, What It Means to Be Human

In her research into the medieval world, Barbara Newman, English, religious studies, and classics, has explored the feminine face of the divine, with special attention to women’s writings, in such works as God and the Goddesses: Vision, Poetry, and Belief in the Middle Ages (2003). She is now studying medieval perceptions of what it means to be human, beginning with the exchange of hearts, a common motif in romances and saints’ lives. In cultures around the world, the heart is seen as much more than a muscle that pumps the blood. Understood as the seat of life and personality, it is the most frequent, symbolically charged emblem for the whole person.

The ancient idea of giving one’s heart to another gains new potency now that transplant surgery makes it physically possible. Yet in medieval texts, both sacred and secular, hearts are already offered and exchanged, pierced and tortured, inscribed and devoured. What begins as a figurative expression—“My heart goes with you.” “You have stolen my heart.”—evolves into a set of insistently material representations. Mystics, always female, offer their hearts to Jesus and receive his in return. Jealous husbands kill and excoriate their wives’ paramours, feeding their hearts to the ladies in a secret cannibal feast. On autopsy, a heart reveals the image of the beloved or, in saintly hearts, the signs of Christ’s passion. Insofar as the heart is the seat of identity, to give one’s heart to another—in life or in death—is, in some measure, to become that other.

In 2009 Newman won a Mellon Distinguished Achievement Award—one of only four scholars in the nation to do so. The three-year grant accompanying the award will support Northwestern’s interdisciplinary program in medieval studies.
Brian Odom
Weinberg College of Arts and Sciences

Revolutionary Molecular Physics

The development of laser cooling and trapping, for which the 1997 Nobel Prize was awarded, led to a revolution in the field of atomic, molecular, and optical physics. Atoms illuminated by carefully tuned laser beams are slowed down (laser cooling), and then held in the gentlest imaginable of containers, where the “walls” are made of electric or magnetic fields (trapping). Unfortunately, the more complex structure of molecules, with tumbling and vibrational motions absent in atoms, makes them too complicated to be laser cooled. The cooling and trapping revolution made atomic, molecular, and optical physics a lopsided field; atoms could be cooled to temperatures billions of times lower than molecules, and measurement of atomic energy levels (spectroscopy) could be performed thousands of times better than for molecules.

With their endless variety and rich internal structure, molecules have always been recognized as holding great promise. Brian Odom, physics and astronomy, and his research team make up one of a handful of groups in the world working to stage a new revolution in atomic, molecular, and optical physics. They are developing techniques to cool and control molecules so that their complexity can be converted from a weakness into a strength. Odom’s group works with trapped molecular ions (molecules missing one or more electrons), cooling their motion to a fraction of a degree above absolute zero by laser-cooling cotrapped atomic ions, which in turn cool the molecular ions. When the molecular ions are moving slowly, the next challenge—one not yet solved by anyone in the field—is to make them stop tumbling and vibrating. To tackle this problem Odom’s group is developing novel techniques to use carefully programmed sequences of laser pulses to coax the molecules into their lowest quantum states.

Once trapped and cooled molecules can be controlled at a quantum level many new applications will become possible, including improvement by orders of magnitude of molecular spectroscopy. Because of their complex internal structure, improved spectroscopy on molecules could have far-reaching impact on diverse areas of physics—from a first observation of tiny fundamental differences between the structure of left- and right-handed molecules (with implications for high-energy physics) to discovery of time-variation of fundamental constants (with implications for cosmology).

This year Odom was awarded a Packard Fellowship in Science and Engineering by the David and Lucile Packard Foundation, a Faculty Early Career Development (CAREER) Award from the NSF, and the Air Force Young Investigator Award.
Aaron I. Packman
McCormick School of Engineering and Applied Science

Arsenic Propagation in Chilean Rivers

Research by Aaron Packman, civil and environmental engineering, centers around environmental and biological transport processes. Packman’s broad research program encompasses the transport of water, sediments, nutrients, carbon, contaminants, and pathogens in rivers, groundwater, building systems, drinking water systems, and biomedical systems such as catheters.

In a recent project Packman collaborated with Jean-François Gaillard, also civil and environmental engineering, and researchers from Pontificia Universidad Católica de Chile (PUC) to understand how arsenic propagates down the rivers that cross the Atacama Desert and to develop strategies that will protect local communities from this natural hazard.

In 2007 and 2008 Packman, Gaillard, their students, and their Chilean collaborators Pablo Pastén and Gonzalo Pizarro conducted field expeditions to characterize arsenic distributions along the Loa and Lluta Rivers, two major tributaries that cross the Atacama Desert in northern Chile. The group took water and sediment samples from different areas along the rivers. In some places—particularly in the Río Salado, the “salty river” that contains very high arsenic concentrations—no life could be found in or around the river.

The group tested some samples on site and brought others back to temporary labs set up at a local hotel. Many samples were shipped back to PUC and Northwestern, and both students and professors are still testing the samples. “The follow-up analysis takes years,” Packman says. Most recently, the group has scanned arsenic distributions in river sediments using X-ray tomography methods that they developed at Northwestern’s Synchrotron Research Center, located at the Advanced Photon Source, Argonne National Laboratory.

The group has discovered that arsenic in the Atacama’s rivers behaves differently from arsenic elsewhere. In most locations, arsenic in river water is mainly associated with iron or manganese particles. In the Rio Loa, arsenic appears to be associated with calcium. Arsenic is highly mobile in this system, and its concentration is controlled by dilution from other rivers and by evaporation, which is quite severe because of the extremely dry climate of the Atacama. The new synchrotron X-ray tomographic analysis tools are now being used to explore mechanisms of arsenic retention in river sediments.

— Adapted from an article by Emily Ayshford in McCormick Magazine
Monica Prasad
Weinberg College of Arts and Sciences
and Institute for Policy Research

The Free Market and the American Tax System

Everyone knows that the United States is the only advanced industrial country without publicly financed national health care or compulsory national health insurance, that it has a public welfare state that is one of the smallest in the Western world, and that there is consequently more poverty and economic vulnerability in the United States than in other wealthy countries. But most people are surprised to learn that of the advanced industrial countries, the United States has the most progressive tax system, in which the tax rate increases as the taxable amount increases.

In her first book, *The Politics of Free Markets*—winner of the Barrington Moore award from the American Sociological Association—Monica Prasad, sociology and Institute for Policy Research, showed that this unusual pattern of revenue generation was one reason why the United States had a much stronger political turn to the market than European countries in the 1980s. Her current work moves further back in history to identify the origins of this unusual tax system, and as a result she is rethinking theories of comparative political economy.

Is the tax system the reason why the United States has resisted national health care for so long? Is the difficulty of raising taxes progressively the reason why it does not have the kind of extensive welfare state found in most European countries? How did the United States end up on this unusually progressive path, and what does that teach us about American history and our current political possibilities? Should the United States adopt a national-level consumption tax, as every other rich country has done? Or should the European welfare states reform their finances along more progressive American lines? These are the questions Prasad’s work addresses. Prasad also has studied carbon taxes in Europe and recently coedited a volume called *The New Fiscal Sociology*. Her work is funded by the NSF. 

Yi Qian
Kellogg School of Management

How Counterfeit Competition Drives Up Price and Quality

Yi Qian, marketing, researches innovations, imitations, and the strategic role of intellectual property rights protections. Strong intellectual property rights are generally considered necessary to encourage innovation and protect the price of authentic products. However, Qian’s research shows that under some circumstances the quality and prices of authentic goods can actually increase with the market entry of counterfeit products.

Qian has found that strong intellectual property rights alone are not enough to ensure innovation. In an award-winning study published in the Quarterly Journal of Economics, she investigated whether intellectual property right enforcement is absolutely necessary to ensure innovation. She found that brands with less government protection differentiate their products through innovation, self-enforcement, vertical integration of downstream retailers, and subtle high-price signals. These strategies push up the prices of authentic products and are effective in reducing sales of counterfeit goods.

A unique historical development allowed Qian to design a study that could separate the causal effect of counterfeit products from other market forces. In the early 1990s the Chinese government had to respond to several food safety situations and gas explosion accidents. In order to deal with these situations, the government had to shift resources from monitoring intellectual property rights in other sectors, including footwear products. The lack of intellectual property right enforcement resulted in counterfeiters entering the Chinese footwear market.

Qian collected data from annual financial statements and other records from 31 companies that produce brand-name products and their corresponding counterfeits for the years 1993 to 2004. Qian was surprised to find that authentic prices went up when counterfeits entered this market. Before counterfeit shoes entered the market, the adjusted price of a high-end authentic shoe was about $43. After the entry of the counterfeits, the price rose to more than $61.

In this paper Qian discusses in detail each strategy that companies used to successfully combat counterfeits: innovation, establishing downstream retail stores, price signaling, self-enforcement, and assisting the government in its enforcement efforts. Her results have generalizable implications.
Bradley B. Sageman  
Weinberg College of Arts and Sciences

**Linking the Carbon Cycle to Global Warming**

Critics of global warming suggest that increases in atmospheric carbon dioxide concentrations (pCO₂) since the Industrial Revolution, documented from ice cores and by direct measurements, represent natural variations in the Earth's carbon cycle. Further, they suggest that the science linking changes in pCO₂ to global warming is uncertain. Both of these assertions are wrong, and geological data can demonstrate why.

Brad Sageman, Earth and planetary sciences, conducts research concerning the processes that regulate the transfer of carbon between its natural sources (such as volcanism or plant and animal respiration) and major sinks (rock weathering, deposition of carbon-rich sediments, and photosynthetic production of plant biomass). These transfers collectively form the Earth's natural carbon cycle, which has been altered by human activities such as fossil fuel combustion and deforestation. One of the greatest challenges for Earth scientists working to employ geological data to improve predictions of future climate change is the fact that ancient records typically have low temporal resolution (e.g., one data point every 0.5 million years). A particular focus of Sageman’s work is the improvement of temporal resolution for studies of selected geological events during which major changes in the carbon cycle took place.

These brief events provide a baseline for understanding natural rates and magnitudes of climate system response to changes in CO₂. They show that increases in CO₂ are clearly linked to warming through Earth history and that the current rate of CO₂ increase is unprecedented. Like the overwhelming majority of his colleagues in the Earth sciences, Sageman has little doubt about the cause of recent CO₂ increases, predictions of continued warming, or the need to mitigate carbon emissions. The goal of his research program is to improve our understanding of how the carbon cycle will change as the planet warms in order to better design mitigation programs.

Sageman’s work is funded by the NSF. He is just completing one NSF-sponsored study in which plant fossils were used to develop a high-resolution reconstruction of changes in atmospheric CO₂ during a 94-million-year-old carbon cycle perturbation. A newly funded NSF project will update and refine the geologic time scale for the Cretaceous Period, a time in Earth history during which massive quantities of carbon were naturally sequestered in marine sediments.
Testosterone May Drive Our Willingness to Take Financial Risks

Testosterone. The word alone conjures up images of pumped-up body builders and pugnacious bullies, but the hormone—critical for human development in both men and women—has been receiving some decidedly down-to-business attention.

Testosterone’s links to risky behavior are nothing new. And while research has shown women to be more risk averse than men, no previous studies have linked those tendencies to testosterone. Paola Sapienza, finance, along with Luigi Zingales and Dario Maestripieri from the University of Chicago demonstrate in “Gender differences in financial risk aversion and career choices are affected by testosterone” (Proceedings of the National Academy of Science 2009) that testosterone levels correlate with both financial risk-taking and career choice.

Sapienza and her colleagues measured index-to-ring-finger ratios (a correlate of prenatal testosterone exposure) and collected saliva to determine testosterone levels of participants who also took part in a carefully constructed lottery—what Sapienza calls “a standard experimental measure of risk aversion” in economic disciplines. The researchers later gathered information on each participant’s career choice.

Their results challenge at least one cliché, that of high-testosterone risk junkies. Individuals with testosterone above a certain level were no more likely to select the risky lottery than they were the sure thing. But below that threshold, financial risk-taking and testosterone were strongly linked, both in the lottery game and in the students’ eventual career choices.

While gender may help explain some of this variation, the real driving force may be the hormone itself. When Sapienza and her colleagues examined the career choices of those who fell under the testosterone threshold mentioned above, there was little discernable difference between the two genders. Higher testosterone, not gender, defined those who took a job in finance.

Sapienza’s research was funded by the Templeton Foundation and the Zell Center for Risk Research. © Mark Huls | www.dreamstime.com
The turbine engine, one of the most efficient energy conversion devices, is used in both aeronautical jet engines and natural-gas fired land-based electrical power generators; a single unit of the latter can produce up to 500 million watts. Because of their excellent high-temperature strength and corrosion resistance, nickel-based superalloys are outstanding materials for turbine blade applications. The continuing efforts made to increase the thermodynamic efficiency of turbine engines—that is, to obtain a high ratio of energy yield to fuel consumption—require high operating temperatures (>1473 degrees Kelvin). Elevating the service temperature of a turbine engine requires improving the high-temperature properties of these superalloys. Oxidation of the blades is, however, a major detrimental process that occurs at elevated temperatures, which results in a loss of material, dimensional blade changes, and initiation of surface cracks that may lead to catastrophic failure of a turbine blade during service. Therefore, improving the oxidation resistance of nickel-based superalloys is of utmost importance for elevating the working temperatures of turbine engines, thereby increasing their efficiency and concomitantly decreasing fuel consumption.

The Seidman research group has made extensive studies of the temporal evolution of the microstructures of model and commercial nickel-based superalloys to obtain a deep scientific understanding of the factors that govern long-term microstructural stability. The microstructure consists typically of two phases: a solid-solution face-centered matrix (the gamma phase), and a crystallographically ordered-phase with the so-called L12 structure (the gamma-prime phase). This research is unique in that it employs a combination of atom-probe tomography and lattice kinetic Monte Carlo simulations, in parallel, to study the chemical and microstructural evolution of the gamma and gamma-prime phases on a subnanoscale to understand the long-term stability of this unique microstructure, which is the basis of all nickel-based superalloys.
James P. Spillane
School of Education and Social Policy

Schoolhouse Organization: Education Policy in School

Though the education policy landscape in the United States has changed dramatically, the fate of new “get tough” federal and state policies will ultimately depend on the local schoolhouse. According to James Spillane, education and social policy and management and organizations at Kellogg, student learning depends in good measure on how schools are organized for teaching and learning. Popular ways of thinking about the school organization are limiting, he argues, in part because they often dwell on the formal at the expense of the informal organization.

Spillane and his colleagues in SESP’s Distributed Leadership Studies are working to change how researchers, practitioners, and policymakers think about school organization by developing and employing a distributed perspective to frame diagnostic and design work. The work takes various forms, from designing and validating research instruments (e.g., social network instruments) to identifying patterns in how schools organize teaching when faced with policies that hold them accountable for student performance.

Among other things, Spillane says that this work shows how school leaders design and redesign organizational routines in efforts aimed at coupling their school’s organizational infrastructure to the policy environment (e.g., high-stakes accountability policies) and to classroom teaching. Organizational routines feature prominently in school-level efforts to respond to a shifting education policy environment.

The work of Spillane and his colleagues involves theory building and theory testing. In addition to generating “what knowledge” (i.e., propositional knowledge), they also use their findings to engage practitioners and policymakers in developing “how knowledge”: the practical knowledge that is critical for improving practice in schools and classrooms. This work is supported by the Carnegie Foundation of New York, the Institute for Education Sciences, the NSF, and the Spencer Foundation.
Preventing and Ameliorating Parkinson’s Disease

Parkinson’s disease is the second most common neurodegenerative disease in the United States, afflicting more than a million older Americans. Its cardinal symptoms are resting tremor, rigidity, and difficult, slow movement. Nothing is known to prevent the disease or slow its progression. In its early stages drugs can ameliorate symptoms, but for most patients these therapies are effective for only a relatively short period of time.

The research team of D. James Surmeier, physiology, at the Feinberg School of Medicine is moving rapidly toward therapeutic strategies that will prevent Parkinson’s disease and more effectively reduce its impact on those already in its grip. Surmeier is director of the Morris K. Udall Parkinson’s Disease Research Center of Excellence at Northwestern University, one of a handful of such centers funded by the NIH to find better treatments for Parkinson’s disease. His work exemplifies the bench-to-bedside translational effort at Northwestern.

Using a combination of cutting-edge scientific approaches aimed at unlocking how specific types of neuron behave in their natural environment, Surmeier’s group discovered that the neurons most vulnerable to Parkinson’s disease share a common stressful “lifestyle” that can be largely corrected with a medication that is already approved for human use. Motivated by Surmeier’s pioneering studies, retrospective examination of patients taking this type of medication (for other reasons) have shown they have a much lower risk of developing Parkinson’s disease. A prospective multicenter clinical trial directed by Tanya Simuni, neurology, is now underway to see if this drug will slow progression in recently diagnosed Parkinson’s disease patients. A collaborative effort also is being mounted with Richard Silverman, chemistry, to find a better, more potent neuroprotective drug.

In addition to his work on the origins of Parkinson’s disease, Surmeier’s team is pursuing how the brain adapts to the disease. These interdisciplinary studies are not only providing fundamental insights into the neural mechanisms underlying disease symptoms, they promise to provide a roadmap for new therapeutic strategies that could dramatically improve the quality of life for Parkinson’s disease patients.
Igal Szleifer
McCormick School of Engineering and Applied Science

Molecular Design of Biomaterials: Theoretical Modeling of Biocompatible Materials and Drug Carriers

What molecular structure allows a synthetic material to optimally interact with biological environments? According to Igal Szleifer, biomedical engineering, the answer depends on the specific application. For example, biocompatible materials must be capable of preventing protein adsorption, which is the first step in the foreign-body response that rejects the materials. In the case of drug delivery systems, there is a need to recognize the unique features of sick cells in order to deliver the cargo.

Szleifer and his group develop and apply theoretical methodologies that enable them to determine what types of molecular structures can be used to optimize the design of biomaterials. In particular, they have demonstrated how polymer molecules end-tethered to materials’ surfaces can be used to control the time and amount of proteins that adsorbed on surfaces. These findings provide specific guidelines for modifying surfaces with improved biocompatibility, and they also lead to a fundamental understanding of the protein adsorption process. The complexity of protein adsorption arises from the need to treat the process over many orders of magnitude in time, i.e. from microseconds to days. The theoretical methods developed by Szleifer’s group enable studies of this large range of time scales without compromising the treatment of molecular details.

Szleifer is studying how the interactions between a drug carrier and cell membranes in drug delivery systems result in changes to the membrane structure and how these changes can be used for the insertion of the drug carrier into the cell. Furthermore, they have found ways to improve the binding of drug carriers to certain type of cells by several orders of magnitude through the proper molecular coating of the carrier.

Szleifer’s theoretical work is carried out in close collaboration with experimental groups at Northwestern and elsewhere and is funded by the NSF, the NIH, and the Department of Energy.
Regan Thomson
Weinberg College of Arts and Sciences

**Synthesizing Complex Bioactive Molecules**

Regan Thomson, chemistry, finds inspiration for his research in diverse natural sources such as sponges, bacteria, fungi, and plants. These organisms are all masters at synthesizing complex bioactive molecules, so-called natural products — something that Thomson seeks to replicate in the lab. While organisms have evolved highly tailored enzymes for their syntheses, Thomson and his colleagues invent powerful reactions to produce quantities of these natural products for further study in collaboration with biologists and medical scientists.

Thomson’s group has a strong interest in a class of complex bioactive molecules called prodigiosins, exemplified by metacycloprodigiosin (see figure). These bright red pigments are produced by bacteria and display a wide range of biological properties, including potent activity against the malaria parasite.

Using chemistry developed in his lab, Thomson and his team have developed the first synthesis of the naturally occurring form of these fascinating molecules. Modification of the synthesis will allow for non-naturally occurring analogs to be rapidly prepared, thus leading to compounds that display superior activity to those produced by the organism.

In this way, the fundamental chemical research of the Thomson lab will play an important role in the discovery and development of solutions to crippling human health conditions. Related efforts are focused on developing methods to prepare compounds with immunosuppressant and anti-Alzheimer’s activity.

Thomson’s research is supported by the NSF through an ARRA Faculty Early Career Development (CAREER) Award, the NIH, and the American Cancer Society.

The chemical structure of metacycloprodigiosin is shown overlaying a culture of the bacteria that produces the prodigiosins.
Richard P. Van Duyne  
Weinberg College of Arts and Sciences

**Nanoscale Light**

At the forefront of current revolutionary developments in nanoscience and nanotechnology is the field of plasmonics, the study of the interaction of light with metallic objects such as thin metal films or nanoparticles. Richard Van Duyne, chemistry, gives this example: “This interaction is strongly dependent on the size and shape of nanoparticles and is manifested by brightly colored scattering [as shown in the lower photograph]. To take a specific example, green light with a wavelength of about 500 nanometers is localized to about 5–10 nanometers at the poles of a nanosphere or the tips of a nanotriangle. When two nanoparticles just touch to form a junction, even greater localization to about 1 nm occurs. Thus by intentionally fabricating nanoparticles with different sizes, shapes, and interparticle spacings, one can ‘squeeze’ light into tiny spaces.”

For Van Duyne, the excitement of plasmonics lies in its potential to achieve highly miniaturized and sensitive optical devices by controlling, manipulating, and amplifying light on the nanometer length scale. In 1977 Van Duyne made his most important discovery: that silver nanoparticles could strongly amplify the Raman scattering of molecules absorbed on them. These studies led to the surface-enhanced Raman spectroscopy (SERS) method for probing molecules, a technique that can provide a signal enhancement factor of more than 10 billion relative to solution-phase measurements. Under special conditions SERS is so sensitive that the identity of single molecules can be revealed.

SERS has transformed Raman spectroscopy into the most sensitive form of molecular spectroscopy and is now a widely used method. SERS is having a profound impact on a broad range of physical and biological research topics including nanoscale spectroscopy, microscopy, nanomaterials synthesis, nanofabrication, and chemical and biological sensing. Van Duyne has also been exploring the use of SERS as a method for minimally invasive glucose sensing and identifying organic pigments in works of art.

Research in the Van Duyne lab has been supported by the NSF, the Department of Defense, the NIH, and the Department of Energy.
Celeste M. Watkins-Hayes  
Weinberg College of Arts and Sciences  
and Institute for Policy Research

Money Matters: Women Coping with HIV/AIDS

The narrative of HIV/AIDS is constantly changing shape and direction as more information comes to light. The 1980s brought the disease into public awareness. The 1990s offered significant medical advances for those living with the virus. Celeste Watkins-Hayes, African American studies, sociology, and Institute for Policy Research, hopes to contribute to this story by bringing focus to the economic and social experiences of women living with HIV.

While a wealth of research exists spotlighting the efficacy of HIV prevention and education efforts, the daily lives of those living with the virus is a rare focus in public and academic spheres. Through two prestigious grants—a Faculty Early Career Development (CAREER) Award from the NSF and a Robert Wood Johnson Foundation Health Investigator Award—Watkins-Hayes hopes to explore how HIV-positive women navigate monetary needs once diagnosed with the disease. Her past work examining the intricacies of the welfare system and the general concerns of women living with HIV/AIDS serves as a foundation for the new study.

This innovative ethnographic analysis seeks to understand how women’s everyday economic survival strategies shape their abilities to manage their health once diagnosed with HIV. While much is made of the medical transformation of HIV/AIDS from an inevitable death sentence to a chronic illness, little attention has been given to the new economic concerns that resulted from this change. Watkins-Hayes will actively recruit HIV-positive women from various ethnic and socioeconomic backgrounds in order to determine how being HIV positive shapes the economic and social contours of women’s lives.

In addition to women living with HIV, AIDS service providers will also be studied to examine how assistance from public, private, and nonprofit organizations contributes to women’s financial resources and how being connected to these institutions can be a crucial step for both the economic and social survival for those afflicted.

Watkins-Hayes will disseminate the findings through presentations for both academic and lay audiences, scholarly and popular press articles, and a book. She also plans to create a web site and policy briefs in the hopes that her findings might have a significant policy and programmatic impact as city, state, and federal government officials, service providers, and the general public fight the AIDS epidemic.
In FY2009 Northwestern University once again recorded a historic high in research awards, with award volume of $476.9 million. This represents an increase of 9 percent ($38.2 million) over FY2008’s total of $438.8 million.

The bulk of these awards—71.9 percent, or $342.9 million—came from the federal government. Yet not all this year’s increase came from federal funding. While we increased our federal funding by 4 percent ($14.6 million), we also increased our funding from industrial sponsors by 57 percent ($25.9 million) and voluntary health organization awards by 17 percent ($2.8 million). State of Illinois agency awards decreased by 36 percent ($3.0 million), while those from foundations were down by 8 percent ($2.5 million).

When comparing Northwestern’s schools, it is important to understand that research in some disciplines is more costly than research in other areas. Significant research may be conducted in sociology, for example, with awards that are much smaller than the funding required to conduct research of comparable import in a field such as medicine or biotechnology. Also, award volume fluctuates from year to year, often due to opportunities in large program activities such as those in cancer research, materials science, and nanotechnology.

The Feinberg School of Medicine increased the dollar volume of its awards by 10 percent ($26.9 million) in FY2009. The volume of awards to University research centers and institutes grew by 40 percent ($10.1 million), while awards to the Judd A. and Marjorie Weinberg College of Arts and Sciences rose by 6 percent ($3.2 million). Awards to the School of Education and Social Policy (SESP) declined by 47 percent ($3.5 million), while those to McCormick were down by 6 percent ($3.3 million).
*Bienen School of Music, Central Administration, School of Continuing Studies, School of Education and Social Policy, Kellogg School of Management, School of Law, and Medill School of Journalism.*
Sponsored Research Awards (Dollars in Millions)

Federal/Nonfederal Awards

Awards by Unit
American Recovery and Reinvestment Act Awards

Northwestern faculty have done well in securing federally sponsored research funding awarded under the American Recovery and Reinvestment Act of 2009 (ARRA). As of November 30, 2009, 172 faculty members had received 191 awards for approximately $100.8 million. The $787 billion stimulus package is intended to jump-start the economy by creating and saving jobs. Using the Office of Management and Budget’s and agency guidelines to calculate the numbers, Northwestern’s ARRA funding created or saved more than 60 jobs through September 30, 2009. The breakdowns below represent ARRA award numbers for fiscal 2009, which ended August 31.

ARRA Awards by Unit

<table>
<thead>
<tr>
<th>Unit</th>
<th># of Awards</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feinberg School of Medicine</td>
<td>51</td>
<td>$11,560,932</td>
</tr>
<tr>
<td>McCormick School of Engineering and Applied Science</td>
<td>25</td>
<td>3,995,210</td>
</tr>
<tr>
<td>Weinberg College of Arts and Sciences</td>
<td>24</td>
<td>3,371,166</td>
</tr>
<tr>
<td>School of Communication</td>
<td>8</td>
<td>926,077</td>
</tr>
<tr>
<td>Research Centers and Institutes</td>
<td>6</td>
<td>4,607,571</td>
</tr>
<tr>
<td>School of Education and Social Policy</td>
<td>2</td>
<td>158,826</td>
</tr>
<tr>
<td>Central Research–The Graduate School</td>
<td>1</td>
<td>1,000,000</td>
</tr>
<tr>
<td>Kellogg Graduate School of Management</td>
<td>1</td>
<td>49,524</td>
</tr>
<tr>
<td>School of Law</td>
<td>1</td>
<td>129,039</td>
</tr>
<tr>
<td>Research Operations</td>
<td>1</td>
<td>500,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>120</strong></td>
<td><strong>$26,292,345</strong></td>
</tr>
</tbody>
</table>

ARRA Awards

*Bienen School of Music, Central Administration, School of Continuing Studies, School of Education and Social Policy, Kellogg School of Management, School of Law, and Medill School of Journalism.
Northwestern researchers submitted a much larger volume of proposals in 2009 than 2008. The total dollar volume of submitted proposals was $2.2 billion, an increase of 34 percent ($556.9 million) over 2008. This increase was due largely to the influx of submissions for ARRA funding.

Feinberg School of Medicine research proposal activity increased by 24 percent ($242.9 million), while proposals from McCormick were up by 83 percent ($194.3 million). Proposals from University research centers and institutes grew by 81 percent ($70.2 million), while proposals from Research Operations grew by $37.7 million. Weinberg College submissions reflected an increase of 16 percent ($30.7 million). The dollar volume of SESP proposals decreased by 47 percent ($15.5 million).

In FY2009 the overall dollar volume of proposals submitted to federal agencies increased by 41 percent ($578.1 million), while submissions to industrial sponsors grew by 11 percent ($5.8 million). The number of proposals to U.S. state and local government bodies rose fivefold ($4.2 million). Proposals to voluntary health organizations reflected a decrease of 26 percent ($21.1 million), while those to State of Illinois agencies also decreased by 72 percent ($8.5 million).

**Proposals by Sponsor**

- 63.4% Department of Health and Human Services
- 12.1% National Science Foundation
- 4.7% Department of Defense
- 11.2% Other Federal
- 2.7% Industry and Trade Organizations
- 2.7% Voluntary Health Organizations
- 2.2% Foundations
- 0.9% Other Nonfederal

**Proposals by Administrative Unit**

- 58.2% Feinberg School of Medicine
- 19.5% McCormick School of Engineering and Applied Science
- 10.0% Weinberg College of Arts and Sciences
- 7.2% University Research Centers and Institutes
- 1.9% School of Communication
- 5.0% Other Units*

*85.4% of metrics have been completed for the fiscal year 2009.

<table>
<thead>
<tr>
<th>Source</th>
<th>FY2009</th>
<th>FY2008</th>
<th>Change (percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department of Health and Human Services</td>
<td>63.4%</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>National Science Foundation</td>
<td>12.1%</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Department of Defense</td>
<td>4.7%</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Other Federal</td>
<td>11.2%</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Industry and Trade Organizations</td>
<td>2.7%</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Voluntary Health Organizations</td>
<td>2.7%</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Foundations</td>
<td>2.2%</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Other Nonfederal</td>
<td>0.9%</td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

**Milestones**

- **19%** of proposals funded by industrial sponsors.
- **12%** of proposals funded by voluntary health organizations.
- **11%** of proposals funded by foundations.
- **11%** of proposals funded by the National Science Foundation.
- **13%** of proposals funded by the National Institutes of Health.

**Deadlines**

- Proposals must be submitted by **December 31, 2009**.
- Applications must be submitted by **November 1, 2009**.

**Notes**

- Percentages do not equal 100% because of rounding.

- Bienen School of Music, Business and Finance, Central Research–The Graduate School, Kellogg School of Management, School of Law, and Medill School of Journalism, Office of Information and Technology, Office of the President, Office of the Provost, Research Operations, School of Continuing Studies, School of Education and Social Policy, Student Affairs, The Graduate School, University Library, University Press.

- NOTE: Percentages do not equal 100% because of rounding.
Sponsored Research Proposals (Dollars in Millions)

Federal/Nonfederal Proposals

Proposals by Unit

Other
University Research Centers
McCormick
Weinberg
Feinberg
American Recovery and Reinvestment Act Proposals

The total number of proposals Northwestern submitted to federal agencies for ARRA funding in fiscal year 2009 was 614, for a total dollar amount of $435.67 million. The Feinberg School of Medicine submitted the greatest number of ARRA proposals in 2009, 442 proposals amounting to $256.87 million, 59 percent of the total. The McCormick School of Engineering and Applied Science came next with 44 proposals, representing $71.46 million, 16 percent of the total. Weinberg College of Arts and Sciences submitted 72 proposals for $34.8 million, 8 percent of the total. Research Operations submitted 3 proposals for $36.9 million, 9 percent of the total. Research Centers and Institutes submitted 25 proposals for $23.75 million, 5 percent of the total. The School of Communication (24 proposals for $8.56 million) and the School of Education and Social Policy (4 proposals for $3.34 million) represent the remaining 3 percent of the total.

ARRA Proposals by Unit

<table>
<thead>
<tr>
<th>Unit</th>
<th># of Proposals</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feinberg School of Medicine</td>
<td>442</td>
<td>$256,866,343</td>
</tr>
<tr>
<td>McCormick School of Engineering and Applied Science</td>
<td>44</td>
<td>$71,458,445</td>
</tr>
<tr>
<td>Research Operations</td>
<td>3</td>
<td>$36,896,422</td>
</tr>
<tr>
<td>Weinberg College of Arts and Sciences</td>
<td>72</td>
<td>$34,795,797</td>
</tr>
<tr>
<td>Research Centers and Institutes</td>
<td>25</td>
<td>$23,753,037</td>
</tr>
<tr>
<td>School of Communication</td>
<td>24</td>
<td>$8,564,823</td>
</tr>
<tr>
<td>School of Education and Social Policy</td>
<td>4</td>
<td>$3,337,306</td>
</tr>
<tr>
<td>Total</td>
<td>614</td>
<td>$435,672,173</td>
</tr>
</tbody>
</table>

*School of Communication and School of Education and Social Policy.*
Expenditures

Northwestern is known for its interdisciplinary approach to research and strongly encourages inter- and multidisciplinary research collaboration. To facilitate such collaborations, it is important to remove administrative barriers that might impede research interactions among departments, centers, and schools.

At the same time, ensuring appropriate credit is vital for fostering research collaborations. Tracking investigator expenditure credit is necessary to determine the appropriate distribution of facilities and administrative cost recoveries as well as for informing decisions regarding the allocation of space and other resources within the University. In addition, the initiation of a facilities and administrative revenue-sharing program with three of the research-intensive schools on the Evanston campus and the research centers reporting to the vice president for research requires expenditure tracking.

Not surprisingly research expenditures—like research submission volume—grew in 2009. Total expenditures (direct plus indirect) increased by 8.6 percent over FY2008 to $400 million. The amount of expenditures for the Feinberg School of Medicine continues to grow, reaching $225.6 million in FY2009. This increase of 10.3 percent followed an increase of 7 percent in 2008. McCormick’s expenditures also grew, by 5.1 percent, to a total of $57.6 million, up from $54 million in FY2008. Weinberg College expenditures grew to $54.3 million, an increase of 12.2 percent. Expenditures for the University’s research centers dipped slightly in FY2009.
### National Institutes of Health Awards to Domestic Institutions of Higher Education
**Dollars in Thousands**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Johns Hopkins University</td>
<td>$457,362</td>
<td>1</td>
<td>$607,223</td>
<td>1</td>
<td>$581,949</td>
<td>1</td>
<td>27.2%</td>
</tr>
<tr>
<td>University of Pennsylvania</td>
<td>376,032</td>
<td>2</td>
<td>471,350</td>
<td>2</td>
<td>438,983</td>
<td>3</td>
<td>16.7%</td>
</tr>
<tr>
<td>Washington University</td>
<td>303,650</td>
<td>5</td>
<td>394,788</td>
<td>5</td>
<td>381,858</td>
<td>6</td>
<td>25.8%</td>
</tr>
<tr>
<td>Duke University</td>
<td>232,180</td>
<td>13</td>
<td>391,196</td>
<td>6</td>
<td>363,960</td>
<td>8</td>
<td>56.8%</td>
</tr>
<tr>
<td>Yale University</td>
<td>256,664</td>
<td>10</td>
<td>336,743</td>
<td>10</td>
<td>363,206</td>
<td>9</td>
<td>41.5%</td>
</tr>
<tr>
<td>Harvard University</td>
<td>270,216</td>
<td>8</td>
<td>321,224</td>
<td>12</td>
<td>349,660</td>
<td>11</td>
<td>29.4%</td>
</tr>
<tr>
<td>Stanford University</td>
<td>224,781</td>
<td>14</td>
<td>305,561</td>
<td>14</td>
<td>287,648</td>
<td>15</td>
<td>28.0%</td>
</tr>
<tr>
<td>Columbia University</td>
<td>248,892</td>
<td>11</td>
<td>330,755</td>
<td>11</td>
<td>278,909</td>
<td>16</td>
<td>12.1%</td>
</tr>
<tr>
<td>Massachusetts Institute of Technology</td>
<td>79,513</td>
<td>53</td>
<td>172,184</td>
<td>30</td>
<td>210,875</td>
<td>20</td>
<td>165.2%</td>
</tr>
<tr>
<td>University of Chicago</td>
<td>131,241</td>
<td>27</td>
<td>194,717</td>
<td>23</td>
<td>208,417</td>
<td>21</td>
<td>58.8%</td>
</tr>
<tr>
<td>Northwestern University</td>
<td>111,299</td>
<td>37</td>
<td>168,377</td>
<td>32</td>
<td>183,389</td>
<td>24</td>
<td>64.8%</td>
</tr>
<tr>
<td>University of Rochester</td>
<td>121,954</td>
<td>32</td>
<td>162,312</td>
<td>34</td>
<td>169,043</td>
<td>29</td>
<td>38.6%</td>
</tr>
<tr>
<td>Cornell University</td>
<td>152,197</td>
<td>23</td>
<td>192,563</td>
<td>24</td>
<td>169,060</td>
<td>30</td>
<td>11.1%</td>
</tr>
<tr>
<td>Princeton University</td>
<td>33,262</td>
<td>84</td>
<td>37,660</td>
<td>99</td>
<td>49,289</td>
<td>80</td>
<td>48.2%</td>
</tr>
<tr>
<td>Rice University</td>
<td>5,488</td>
<td>174</td>
<td>10,088</td>
<td>163</td>
<td>11,709</td>
<td>N/A</td>
<td>113.4%</td>
</tr>
</tbody>
</table>

Source: National Institutes of Health


*Note: NIH ceased formally ranking institutions in 2005; 2008 rankings calculated from NIH “Aggregate Data 2008”

http://report.nih.gov/award/trends/AggregateData.cfm

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### National Institutes of Health Awards Statistics

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NIH Total Budget</td>
<td>$20,513,056</td>
<td>$28,626,151</td>
<td>$29,327,874</td>
<td>43%</td>
</tr>
<tr>
<td>NIH Overall Success Rate</td>
<td>32%</td>
<td>22%</td>
<td>22%</td>
<td></td>
</tr>
</tbody>
</table>

Source: National Institutes of Health


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Northwestern had a mixed year in terms of rankings of federal awards. As compared to other universities, Northwestern advanced in the ranking of volume of National Institutes of Health (NIH) awards for 2008 (data on federal agencies lag by one year); with $183.39 million, Northwestern was ranked 24th in 2008, after occupying the 32nd slot in 2005 and the 37th slot in 2001. The overall increase in NIH funding from 2001 to 2008 was 64.8 percent, while NIH’s budget grew only 43 percent over the same period.

The picture was not as positive for National Science Foundation (NSF) awards, where Northwestern was down to 38th place in 2008 from an all-time high of 27th place in 2007. The overall increase in NSF funding from 2001 to 2008 was 4.9 percent.
National Science Foundation Award Summary by Top Institutions*
(Dollars in Thousands)

<table>
<thead>
<tr>
<th>University</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2008 Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cornell University (Endowed)</td>
<td>594,306</td>
<td>590,192</td>
<td>588,904</td>
<td>510,968</td>
<td>511,548</td>
<td>1</td>
</tr>
<tr>
<td>University of Chicago</td>
<td>31,990</td>
<td>45,960</td>
<td>40,623</td>
<td>43,593</td>
<td>76,476</td>
<td>7</td>
</tr>
<tr>
<td>Columbia University</td>
<td>70,424</td>
<td>69,901</td>
<td>72,084</td>
<td>62,482</td>
<td>74,144</td>
<td>8</td>
</tr>
<tr>
<td>Massachusetts Institute of Technology</td>
<td>69,337</td>
<td>62,011</td>
<td>55,766</td>
<td>56,239</td>
<td>57,202</td>
<td>14</td>
</tr>
<tr>
<td>Stanford University</td>
<td>68,203</td>
<td>48,678</td>
<td>53,778</td>
<td>55,978</td>
<td>50,362</td>
<td>20</td>
</tr>
<tr>
<td>Princeton University</td>
<td>38,864</td>
<td>38,554</td>
<td>44,301</td>
<td>39,554</td>
<td>41,180</td>
<td>31</td>
</tr>
<tr>
<td>Duke University</td>
<td>29,434</td>
<td>33,227</td>
<td>31,884</td>
<td>34,377</td>
<td>35,185</td>
<td>32</td>
</tr>
<tr>
<td>Harvard University</td>
<td>46,370</td>
<td>32,394</td>
<td>29,15</td>
<td>35,687</td>
<td>33,683</td>
<td>36</td>
</tr>
<tr>
<td>Northwestern University</td>
<td>42,475</td>
<td>29,503</td>
<td>33,234</td>
<td>41,657</td>
<td>32,274</td>
<td>38</td>
</tr>
<tr>
<td>University of Pennsylvania</td>
<td>33,006</td>
<td>28,300</td>
<td>27,415</td>
<td>27,643</td>
<td>27,991</td>
<td>27</td>
</tr>
<tr>
<td>Yale University</td>
<td>24,142</td>
<td>27,001</td>
<td>27,791</td>
<td>22,028</td>
<td>27,398</td>
<td>49</td>
</tr>
<tr>
<td>Rice University</td>
<td>25,623</td>
<td>20,481</td>
<td>26,221</td>
<td>24,574</td>
<td>26,091</td>
<td>50</td>
</tr>
<tr>
<td>Johns Hopkins University</td>
<td>30,170</td>
<td>27,748</td>
<td>28,856</td>
<td>34,494</td>
<td>24,747</td>
<td>52</td>
</tr>
<tr>
<td>Washington University</td>
<td>10,831</td>
<td>15,254</td>
<td>18,565</td>
<td>17,901</td>
<td>18,893</td>
<td>66</td>
</tr>
<tr>
<td>University of Rochester</td>
<td>10,841</td>
<td>7,703</td>
<td>13,297</td>
<td>9,872</td>
<td>11,256</td>
<td>89</td>
</tr>
<tr>
<td>NSF Total Funding</td>
<td>$5,577,800</td>
<td>$5,472,800</td>
<td>$5,645,800</td>
<td>$6,020,200</td>
<td>$6,474,000</td>
<td></td>
</tr>
</tbody>
</table>

*Those categorized as “University”

Top Institutions in Total Research and Development Expenditures in Non-Science and Engineering (Dollars in Thousands)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvard University</td>
<td>535,303</td>
<td>551,023</td>
<td>553,831</td>
<td>542,611</td>
<td>6</td>
<td>20.7%</td>
</tr>
<tr>
<td>Northwestern University</td>
<td>25,074</td>
<td>26,284</td>
<td>29,797</td>
<td>29,715</td>
<td>11</td>
<td>18.5%</td>
</tr>
<tr>
<td>Massachusetts Institute of Technology</td>
<td>17,970</td>
<td>16,265</td>
<td>22,595</td>
<td>23,269</td>
<td>15</td>
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<td>22,159</td>
<td>22,404</td>
<td>20,391</td>
<td>19,858</td>
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<td>-10.4%</td>
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<td>14,634</td>
<td>12,089</td>
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<td>6,983</td>
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<td>1,790</td>
<td>3,855</td>
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<td>150.5%</td>
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<tr>
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<td>2,941</td>
<td>2,829</td>
<td>3,769</td>
<td>135</td>
<td>35.8%</td>
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<td>Washington University</td>
<td>3,433</td>
<td>3,796</td>
<td>3,659</td>
<td>3,071</td>
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<td>-10.5%</td>
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<tr>
<td>University of Chicago</td>
<td>2,404</td>
<td>2,847</td>
<td>3,256</td>
<td>2,673</td>
<td>160</td>
<td>11.2%</td>
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<tr>
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<td>836</td>
<td>1,188</td>
<td>2,005</td>
<td>2,647</td>
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<td>216.6%</td>
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<tr>
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<td>667</td>
<td>481</td>
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<td>1,703</td>
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Source: www.nsf.gov/statistics/nsf009303
Late in 2009 Jay Walsh, vice president for research, assumed responsibility for the Technology Transfer Program, which formerly reported to the University president. In the past five years, this program has facilitated the start-up of 25 companies as well as handling nearly 800 invention disclosures. In that same period 108 U.S. patents have been issued for 765 U.S. patent applications.

Since 2005–06 the bulk of the monetary returns from Technology Transfer has come from the patent on pregabalin, a synthesized organic molecule discovered by Richard Silverman, chemistry, which ultimately was marketed as Lyrica, a drug sold by Pfizer Inc. and used to combat epilepsy, neuropathic pain, and fibromyalgia.

Material transfer agreements (MTAs) are now handled through the Office for Sponsored Research. The Technology Transfer Program deals with more than 400 MTAs each year.


<table>
<thead>
<tr>
<th>University</th>
<th>2004</th>
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<th>2006</th>
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<td>6,125,000</td>
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<td>27,987,375</td>
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<td>12,402,873</td>
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<td>6,321,110</td>
<td>12,369,870</td>
<td>13,938,457</td>
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<td>29,990,550</td>
<td>85,298,599</td>
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<tr>
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<td>N/A</td>
<td>N/A</td>
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<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

¹Does not include data from the Applied Physics Lab

Note: The comparative figures in these tables come from AUTM U.S. Licensing Activity Survey, FY2007: A Survey Summary of Technology Licensing (and Related) Activity for U.S. Academic and Nonprofit Institutions and Technology Investment Firms, Dana Bostrom, Robert Tieckelmann, and Richard Kordal, eds., Association of University Technology Managers*. 

U.S. Licensing Activity Survey: FY2007

<table>
<thead>
<tr>
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<td>149</td>
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<td>82</td>
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<tr>
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<td>5</td>
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<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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</tr>
</tbody>
</table>

¹Does not include data from the Applied Physics Lab
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Gretchen Livingston
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Sigmund A. Weitzman
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Laurie S. Zoloth

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David Rosenfeld (DuPont)

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Jelena Radulovic
Claus-Peter Richter

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Mansour Mohamadzadeh
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Iwona Spach
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Nicolette Zielinski-Mozny

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Alan R. Hauser
Mary Cipriano
Diane Rodi
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L. Todd Leasia

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Mary Cianfrocca
Keren Dimah
Linda Fonseca
Christine Gagnon
Raymond Gunn
Renee Krupa
Christina Marciniak
AnnChristine Thastrom

Sasha Ulrich
Leonard Wade
Dennis West

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Mark Kendall
Annette Kinsella
June McKoy
Richard Meagher
Helen Micari
Maureen Moran
Bernice Ruo
Doreen Salina
Mitchell Saulisbury-Robertson
Rebecca Shore
Lucas Sikorski

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Robert Hartke
Stuart Hassell
Michael Ison
Ravi Kalhan

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Joanne Archibald
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Marla Clayman
Keren Dimah
Beatrice Edwards
Mark Eskandari
Kathleen Fitzgerald
Nathalia Headley
Lisa Linn
Maureen Moran
Linda Morris
Carol Podlasek
Doreen Salina
Mitchell Saulisbury-Robertson
Lucas Sikorski
Elyse Stuart
Dennis West
Panel C
Jonathan Goldman, Chair
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Joseph Feinglass
Svena Julien
Zoran Martinovich
Robert McCarthy
Deborah Miller
Maureen Moran
Kenji Muro
Leah Pentz
Khari Reed
Kimberly Scarsi
Liz Pampel Willock
Alternate Members
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Alan Boghosian
Sandi Burbridge
John Cummins
Glenn Krell
Lisa M. Linn
Jing Liu
Doreen Salina
Lucas Sikorski
Dennis West
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Arnold Brookstone
John Crispino
M. Rosario Ferreira
Andrew Hansen
Richard Harvey
Robert Galiano
Monica Kwiatek
Gary MacVicar
Trudy Mallinson
Richard Meagher
Mary Jo Nutter
Reed Omary
Jane Regalado
Camille Renella
Eric Ruderman
Alternate Members
Joanne Archibald
Al Benson
Keren Dimah
Terra Frederick
John Gatta
Bing Ho
Maxine Kuroda
Maureen Moran
Doreen Salina
Mitchell Saulisbury-Robertson
Lucas Sikorski
Dennis West
Panel E
Michael Roloff, Chair
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Helen Micari
Daniel Molden
Kathleen Murphy
Margaret Unger
Dennis West
Alternate Members
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Carla Barnwell
Amanda Hitchell
Ann Marie LoPrieno
Maureen Moran
Darlene Redmond
Doreen Salina
Lucas Sikorski
Liz Pampel Willock
Panel Q
Maureen Moran, Chair
Mark Agulnik
June McKoy
Sigmund Weitzman
Dennis West
Liz Pampel Willock
Alternate Members
Joanne Archibald
Janet Cahill
Deborah Coleman
Madeline Dones
Steve Gard
Jonathan Goldman
Robert Hartke
Amanda Hitchell
Svena Julien
Ann Marie LoPrieno
Deborah Miller
Mary Jo Nutter
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**James P. Spillane** is the Spencer T. and Ann W. Olin Chair in Learning and Organizational Change in the School of Education and Social Policy (SESP), professor of human development and social policy and learning sciences at SESP and (by courtesy) management and organizations at Kellogg. He is also a faculty associate in the Institute for Policy Research. Spillane is working to change how researchers, practitioners, and policy-makers think about school organization by developing and employing a distributed perspective to frame diagnostic and design work. Spillane currently is undertaking an empirical investigation of the practice of leadership in urban elementary schools that are working to improve mathematics, science, and literacy instruction. Read more about his work on page 44.

**Andrea Dunaif**, Charles F. Kettering Professor of Medicine and Chief, Division of Endocrinology, Metabolism and Molecular Medicine at Feinberg School of Medicine focuses on reproductive physiology and metabolism in women. She is an internationally recognized expert on polycystic ovary syndrome, the most common endocrine disorder in premenopausal women. Dunaif’s research has led the way in redefining polycystic ovary syndrome as a serious metabolic disorder that affects women across their lifespan and in revolutionizing its treatment with insulin-sensitizing drugs. Read more about her research on page 28.

**Drew Edward Davies** is an assistant professor of music studies at the Bienen School of Music. He studies the music and cultures of New Spain (viceregal Mexico) in the 16th through 18th centuries. Granted unprecedented access to the archive of Durango Cathedral, Davies organized and cataloged the entire 836-work collection of 18th-century manuscripts according to international criteria—the only such project completed to date in Spanish America—and now advises similar projects in Mexico City and Guadalajara. Read more about his research on page 26.

**Henry D. Godinez** is an associate professor of theatre in the School of Communication and artistic director of the Theatre and Interpretation Center (TIC) at Northwestern. He also serves as the resident artistic associate at the Goodman Theatre in Chicago and directs its biennial Latino Theatre Festival, which features international, national, and local Latino theatre companies. Read more about his work on page 30.

Photographs of Dunaif and Spillane by Andrew Campbell.
Photograph of Davies by Edward Chick.
Photograph of Godinez by Peter Wynn Thompson.