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My No. Deans/Research Magazine

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திகதி
Date 25.08.2014

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பேராதனைப் பல்கலைக்கழகம்" இலங்கை
UNIVERSITY OF PERADENIYA, SRI LANKA

International Research Centre

27 AUG 2014
16941

To All Deans

E-NB
E-Circular

Dear Sir,

University of Peradeniya Research Magazine

Greetings from the InRC. It gives me great pleasure to announce the calling of articles for the first issue of the University of Peradeniya Research Magazine. The Board of Management of the InRC discussed and decided that the University should issue a popular science magazine highlighting the research activities taking place in the institution and that the International Research Centre would spear head the venture.

We would like to thank you for your support thus far in nominating the editorial board and revising the guidelines of the Magazine. Please find attached herewith the final guidelines of the magazine along with sample articles of each category as approved by the Editorial Board at its second meeting.

We request that each faculty provide us with the following,

Research Feature- the name of one research group - deadline September 15th
Identified for their research capacity (Research feature article will be prepared by the Editorial Board members following an interview with the members of the research group)

Research briefs- a maximum of 5 articles (articles prepared according to the sample article should be submitted) - deadline September 30th

Research News- a maximum of 5-10 articles (articles prepared according to the sample article should be submitted) - deadline September 30th

The procedure for submission would be with the approval from the Faculty Research Committee, Dean of Faculty and through the respective Faculty representatives of the Editorial Board to the Editorial Board. We look forward to your continued support and suggestions.

Dr. Nanda Gunawardhana
Director

Director
International Research Center
University of Peradeniya
Peradeniya,
Sri Lanka.

CC:
Chairpersons of the Faculty Research Committees
Members of the Editorial Committee of the University of Peradeniya Research Magazine

Outline of the proposed research magazine for University of Peradeniya

Name of the magazine: University of Peradeniya Research

No of issues: 2 per year

Editorial board: Editor in chief, Members (Director/ InRC, Two representatives from each faculty), Designer

Contents:

Cover page (background image with the title of the magazine)

Contents page

Research Briefs (200 – 500 words, 1-3 images)

These are popular science articles summarizing findings from a research study. The title should be descriptive and should generate interest among readers. The title could be in the form of a question. The contents of the article may include details about the author/s including photographs and the key findings of the study in language easily grasped by the general public. It is required to provide 1 to 3 images related to the article. The length is 200 to 500 words. (See attached for examples)

Research Features (1000 – 1500 words, 3 – 6 images)

These are articles summarizing the work of a research group. The title should be short and indicate the area of research. The article should summarize the details of the research group including its members, goals, key findings over the years and what impact it has made to the society in general. It is required to include 3 to 6 images, preferably with a cover image for the article. The length is 1000 to 1500 words. (See attached for examples)

News (up to 150 words, 1 image)

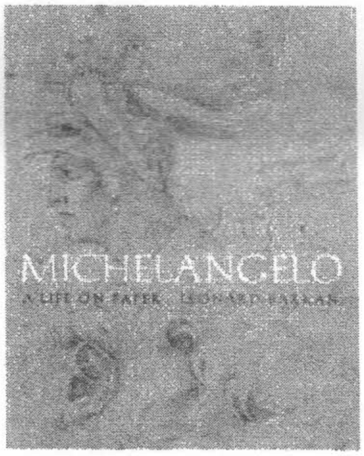
These are short write-ups about honours received by the staff / students, research grants, visiting scholars, collaborations etc. The length is up to 150 words and can include 1 image.

Annexure: Examples of Research Briefs

Leonard Barkan

Michelangelo: A Life on Paper

(Princeton University Press, 2010)



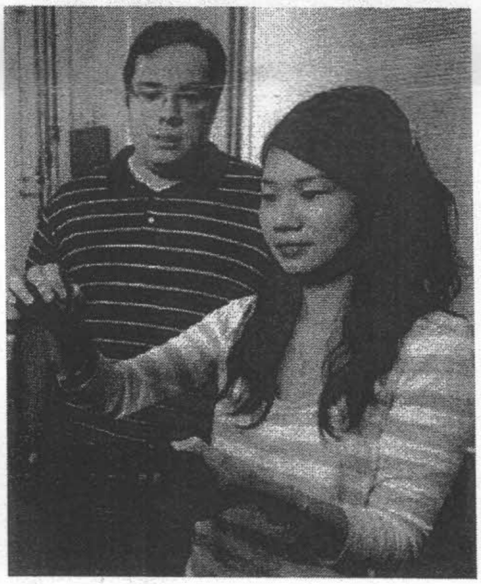
Poems, grocery lists and other works provide fascinating insights into Michelangelo's personality — at times introspective and melancholy, at other moments light-hearted and irreverent.

In his book *Michelangelo: A Life on Paper*, Leonard Barkan, the Class of 1943 University Professor of Comparative Literature, explores the interplay of words and images on more than 200 of the artist's personal drawings and writings.

"They are things he produced for his eyes only, or for the eyes of a very few people," said Barkan, who traveled to Italy, England and France to examine hundreds of sheets of paper used by Michelangelo during his 75-year career. "They are doodles — verbal and visual doodles — and accidents of inspiration. They give us a sense of what was on his mind."

Michelangelo: A Life on Paper
(Image courtesy of Princeton University Press)

Lasso peptides round up bacteria



Assistant Professor James Link and graduate student Jessica (Si Jia) Pan are developing peptide drugs that could treat antibiotic-resistant infections.

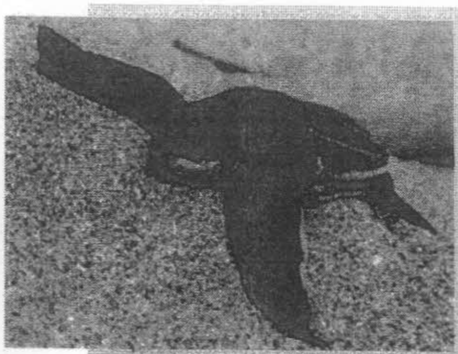
Princeton researchers are applying Darwinian evolution principles to naturally occurring antibacterial molecules to create novel antibiotics for the food and drug industries.

Bacteria secrete antimicrobial peptides — short chains of amino acids — for defense against other species. James Link, an assistant professor of chemical and biological engineering, is pioneering research on a class of such peptides that are lasso-shaped, which makes them resistant to the body's defense mechanisms and hence good drug candidates. "We're understanding how these amazing structures are made by bacteria," Link said. "Thermodynamically they shouldn't exist."

Starting with one particular lasso peptide, Link and graduate student Jessica (Si Jia) Pan created a dozen variants with more antibiotic potency. The researchers used a method called directed evolution in which they create random mutations, test for desirable properties and repeat. They screened 20,000 variations of the peptide for the most promising molecules and found the most promising to be as potent as the antibacterial peptides used in the food industry to protect perishables.

The researchers are now trying to beat harmful, adaptive bacteria such as *Escherichia coli* at their own game. "We're trying to use directed evolution to find a peptide that can kill *E. coli* that are resistant to it," Link said. "In the same way that bacteria evolve resistance, we can try to evolve peptides that overcome that resistance."

The work, which was published in the April 2011 issue of the *Journal of the American Chemical Society*, was funded in part by the National Science Foundation and Princeton's Project X, which is designed to allow faculty members in the School of Engineering and Applied Science to pursue unconventional but promising research.



Unchecked climate change will likely almost completely wipe out the eastern Pacific leatherback sea turtle by the end of the century, according to researchers at GFDL and Princeton University.

Spotlight on the Geophysical Fluid Dynamics Laboratory

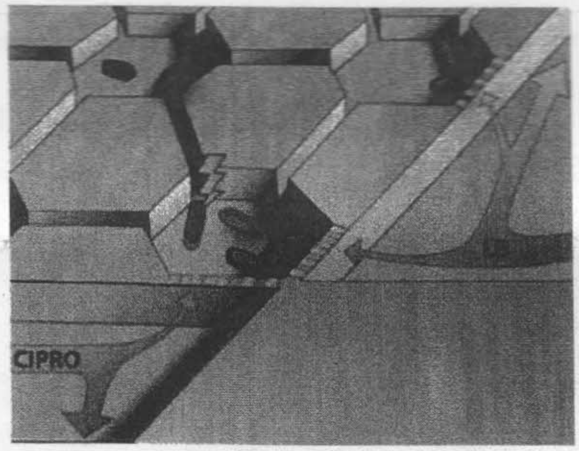
Princeton researchers collaborate closely with researchers from the National Oceanic and Atmospheric Administration (NOAA)'s Geophysical Fluid Dynamics Laboratory (GFDL), located about three miles from the University's main campus at Princeton's Forrestal Campus. GFDL is a leading research center in the development and use of mathematical models and computer simulations to improve our understanding and prediction of the behavior of the atmosphere, ocean and climate. GFDL efforts include hurricane research and prediction, seasonal forecasting, and understanding and projecting climate change. In the July 2012 issue of *Nature Climate Change*, Vincent Saba, a research fishery biologist with NOAA's National Marine Fisheries Service based at GFDL and a visiting research collaborator in Princeton's Program in Atmospheric and Oceanic Sciences, and colleagues reported that unchecked climate change will likely almost completely wipe out the eastern Pacific leatherback sea turtle (left) by the end of the century.

Focus on Princeton's Physical Sciences-Oncology Center

Game theory could help researchers gain an understanding of the dynamics of cancerous-tumor evolution under stress, according to research published in the journal *AIP Advances* in March 2012 by researchers at Princeton and the University of California-San Francisco. To explore interactions of cells in a rapidly growing tumor, the researchers modeled non-cancerous cells as cooperators, which obey the rules of communal survival, and tumor cells as cheaters, which do not obey these rules. The researchers found that the simulation was most accurate when it included how the cells behave in localized regions of the tumor rather than the entire tumor.

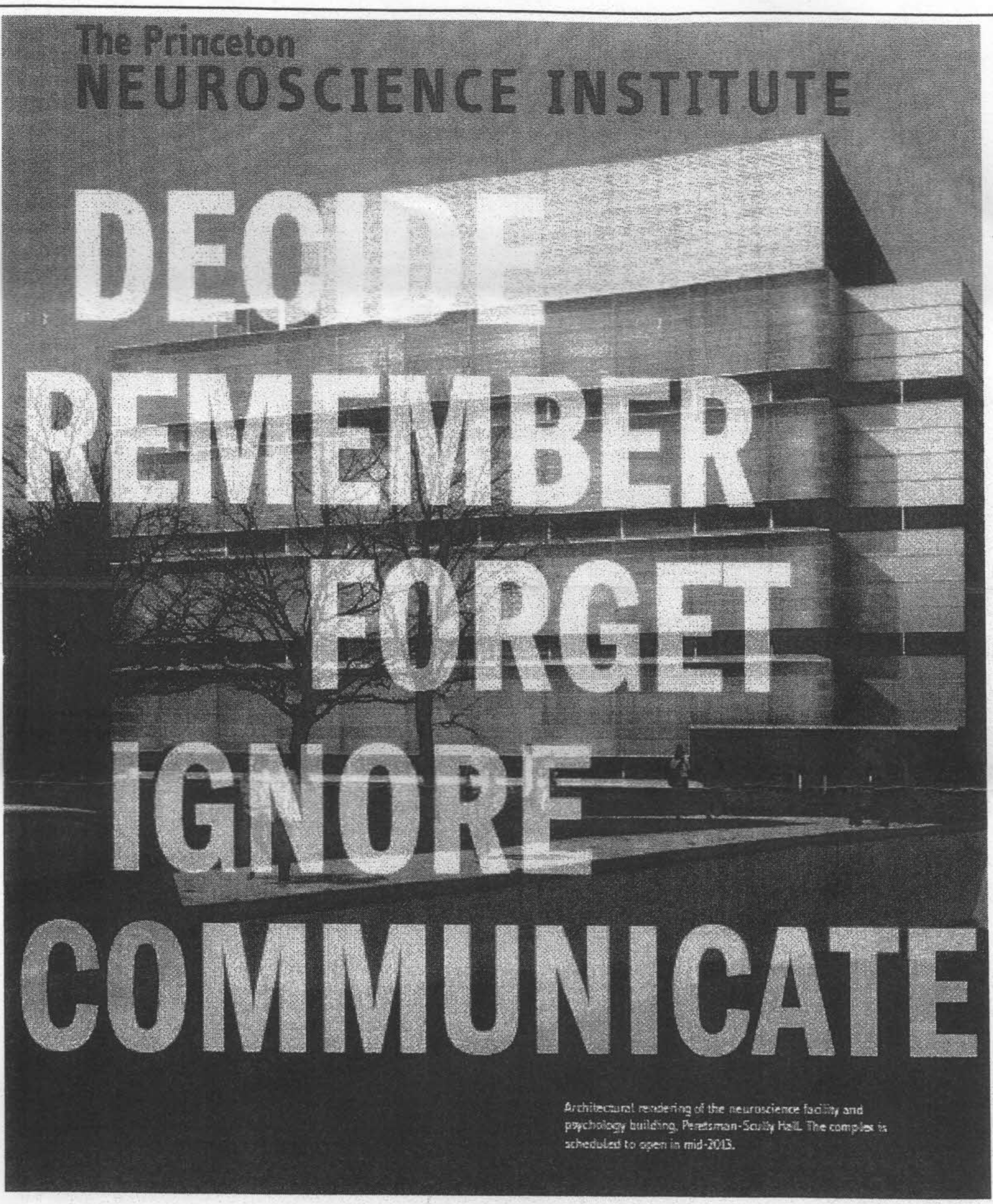
The researchers are affiliated with Princeton's Physical Sciences-Oncology Center (PPS-OC), an interdisciplinary research center aimed at exploring the physical laws that govern the emergence and behavior of cancer. The center is led by Robert Austin, a professor of physics at Princeton, and includes collaborators at the University of California-San Francisco, Johns Hopkins University, the University of California-Santa Cruz and the Salk Institute for Biological Studies. Funded by the National Cancer Institute, the PPS-OC operates within a collaborative network of 12 other physical sciences–oncology centers.

In related work, Austin and colleagues reported in the journal *Science* in September 2011 the creation of a silicon-based microhabitat for studying the development of antibiotic resistance in bacteria. They constructed a plate containing tiny hexagon-shaped rooms connected by microscopic channels. Compared to conventional research flasks and dishes, the microhabitat is meant to more closely resemble the environment in living organisms. Austin and colleagues found that in this special habitat, bacteria evolved to be resistant to the antibiotic ciprofloxacin much more quickly than did bacteria growing in flasks. The research could make it easier for scientists to study how bacteria evade drugs and how to prevent resistance from developing.



The design of the micro-environment allows bacteria (red and green) to squeeze through channels as they search for nutrients (LB) that flow into the chambers through tiny slits. When the antibiotic ciprofloxacin (CIPRO) is added, bacteria evolve resistance to the drug much more rapidly than they would in an open environment. (Image courtesy of Robert Austin)

Example on Research Features



Architectural rendering of the neuroscience facility and psychology building, Peretsman-Scully Hall. The complex is scheduled to open in mid-2013.

Researchers at the Princeton Neuroscience Institute (PNI) are tackling some of the biggest mysteries of the human mind: Why we think and behave as we do, how we make decisions, how we choose what to ignore and remember, and how we can learn to forget.

These abilities arise from our 100 billion brain cells, each of which communicates with about 10,000 other nerve cells. Discovering how these neural conversations give rise to a thought, a memory or a decision is the goal of Princeton neuroscientists. Some of these scientists come at the challenge by probing individual neurons, while others study the activity of entire brain regions. Only by understanding both the big picture and tiny details of neuronal function and communication can we begin to understand the complexity of the brain, said PNI co-directors, Jonathan Cohen, the Robert Bendheim and Lynn Bendheim Thoman Professor in Neuroscience, and David Tank, the Henry L. Hillman Professor in Molecular Biology.

These two scientists epitomize PNI's approach to understanding the brain. Cohen looks at brain activity and constructs theories of how we guide attention, thought and action in accordance with our goals and intentions. Tank uses a microscope trained on living neurons to explore how networks of these cells orchestrate short-term memory and decision-making.

"The institute successfully spans the different levels of analysis that we frankly need for understanding how the brain gives rise to thoughts, feelings and behaviors," Cohen said.

"This continuum of people with expertise in computation, mathematics, psychology, biology and related disciplines is what helps set the Princeton Neuroscience Institute apart," Tank added.

PNI was founded in 2005 and houses three centers (see box on page 22) as well as a program in computational neuroscience. The institute also oversees Princeton's graduate program in neuroscience (see box on page 23) and will be moving to a newly built research facility in 2013.

A new facility for PNI and a new home for the Department of Psychology are being built side-by-side with occupants slated to move into the new buildings in mid-2013. "Positioning the neuroscience and psychology buildings next to each other will facilitate interaction between researchers," said Princeton Provost Christopher Eisgruber, "and grow the outstanding quality of neuroscience and psychology research at Princeton."

Decide

The interdisciplinary nature of Princeton neuroscience is what attracted Carlos Brody to PNI. Brody, an associate professor of molecular biology and PNI, is also a Howard Hughes Medical Institute (HHMI) investigator. He focuses on developing computational models that explain the neural pathways behind behavior and cognition. One such model simulates decision-making behavior in the prefrontal cortex, the area of the brain behind the forehead. Even when we make what seems like a simple decision, neurons are sending and receiving signals to and from thousands of other cells within their neural network.

Carlos Brody

"We are just at the beginning of understanding the brain, so we rely on model systems that can help us understand how the brain works," Brody said. "It is the connections between neurons that make the brain work the way it does."

Brody and his team are using a computer model to explore a theory of decision-making wherein the brain tallies information little by little until it finally makes a decision. Usually this happens so quickly that we are unaware of it. But sometimes the process happens slowly, like in the morning when it takes you several seconds to realize that your alarm clock is beeping and it is time to get out of bed.

To test his computer model of how the brain tallies incoming information prior to making a decision, Brody trained laboratory rodents to respond to a series of sounds coming from the right or left side. To earn a reward, the rodents had to decide from which side the majority of sounds were coming, and then look in that direction.

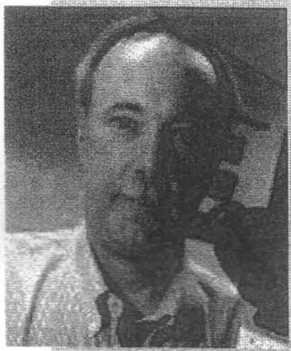
During the experiment, Brody and his team monitored the rodents' brains to determine which neural networks in the prefrontal cortex were active. Their research, which is ongoing and is supported by HHMI and the Human Frontier Science Program, could shed light on how we create so-called "working memory," the temporary store of information that is essential for making decisions and other cognitive functions.

Remember

The brain's working memory is a central component not only of decision-making but also of navigation behavior. PNI co-director David Tank and his team are studying how networks of neurons create working memory in mice navigating a virtual maze.

While navigating the maze, each mouse sees visual patterns it has learned to recognize as an indication to turn at an upcoming intersection in the maze. The animal must then hold the signal in memory until it reaches the turn. Tank and his colleagues discovered that during this task the neuron populations involved in storing the memory fire in distinctive sequences. The study was published in the journal *Nature* in April 2012 and was supported by the National Institutes of Health, including a National Institutes of Health Challenge Grant, part of the American Recovery and Reinvestment Act of 2009.

Tank's research seeks to understand the neural dynamics underlying both working memory and decision-making, particularly when they work together.



David Tank

Tank uses mathematical models and statistical data analyses to describe how the firing activity of neurons, linked together into neural circuits, causes memories to be held or lost and how they lead to decisions.

"Studies such as this are aimed at understanding the basic principles of neural activity during memory and decision-making in the normal brain," Tank said. "However, the work may in the future assist researchers in understanding how activity might be altered in brain disorders that involve deficits in working memory. Schizophrenia is one disorder thought to involve deficits in working memory."

Forget

Our ability to recall previous experiences, while impressive, can weaken due to age or other factors. But assigning a timestamp to a memory, said Kenneth Norman, an associate professor of psychology and PNI, can help the brain retrieve important information when needed. Norman suspects that people categorize the "when" of a memory by storing additional information about what happened just before or just after the event. If you stopped for a cappuccino after class one day, for example, remembering the café could jog your memory of the lecture topic.

With his students, Norman is developing computational theories of how timestamping works and testing these theories against experimental data. The work could lead to new techniques that enhance our ability to remember.

"Using computers, we can build networks of neurons and test our theories of how the strength of the connections between those neurons change as a function of experience," Norman said. "If we build a good model, these networks should 'remember' in the same way that humans do."

Although memory is essential, forgetting also can be valuable. Methods for extinguishing bad memories could be of use in treating post-traumatic stress disorder.

Norman is exploring the idea that bringing a memory partially to mind can weaken or extinguish it. "If you totally shut out a memory, then, according to our theory, it will come back just as strong as it was before," Norman said of the research, which is sponsored by the National Institute of Mental Health. "Similarly, if you constantly relive the memory, it will get stronger. We hope to develop procedures for eliciting just the right level of memory."

Weak recall of a memory may be what helps the brain forget. To test this idea, Norman and his team are scanning brains of human volunteers using functional magnetic resonance imaging (fMRI), which reveals active areas of the brain by measuring blood flow. A participant is asked to study several randomly generated pairings of words and photographs — for example, the word "nickel" paired with a photo of a man's face — until the two concepts are linked in the participant's mind. Then the researchers present the cue word nickel and ask the participant to avoid thinking about the associated picture. The researchers look at the brain's activity to see how much the picture of the man is coming to mind while participants try to avoid thinking about it. Results from this study show that, when the picture comes to mind moderately, this leads to forgetting the word-picture association.

Ignore

Just as forgetting unpleasant memories is useful for mental health, so is being able to ignore unwanted details when necessary. When hailing a cab in a major city, your brain can ignore hundreds of cars

Kenneth Norman

The Princeton Neuroscience Institute (PNI) is home to three centers that cover the spectrum of neuroscientific research.

- **The Bezos Center for Neural Circuit Dynamics:** Princeton's newest center supports the development of new methods and instrumentation to characterize patterns of neural activity and connections in large populations of individual neurons during brain functions such as sensory perception, memory and decision-making.
- **The McDonnell Center for Systems Neuroscience:** This center supports the general study of neural coding and dynamics in different behaviors, as well as how circuits in different brain areas work together in systems. Understanding this intermediate level of organization could yield vital information about neurological disorders such as autism and Alzheimer's diseases.
- **The Scully Center for the Neuroscience of Mind and Behavior:** Research in this center focuses on how the physical mechanisms of the brain give rise to language, emotions, problem-solving and decision-making. The center's fMRI brain-imaging facilities, aided by enhanced analysis techniques developed by Princeton computer scientists, are allowing for novel correlations between brain activity and behavior, thoughts and actions.

Examples of News:

Four Princeton researchers receive inaugural Simons Investigators award

Clockwise from left: Frans Pretorius, Manjul Bhargava, Sanjeev Arora and Amit Singer

Princeton University faculty members were selected in 2012 as four of 21 inaugural Simons Investigators, a prestigious program aimed at supporting research by mathematicians, theoretical physicists and theoretical computer scientists. Each faculty member will receive an initial five-year, $500,000 grant from the New York-based Simons Foundation, which is dedicated to advancing the frontiers of research in mathematics and the basic sciences. Recipients of the award did not know they were being considered.

The four Princeton awardees were: Manjul Bhargava, the Brandon Fradd, Class of 1983, Professor of Mathematics, who was honored in mathematics for his work in the field of algebraic number theory and the geometry of numbers; Amit Singer, an associate professor of mathematics and the Program in Applied and Computational Mathematics, who was honored in mathematics for contributions to a variety of problems in applied mathematics; Sanjeev Arora, the Charles C. Fitzmorris Professor in Computer Science, who was honored in computer science for his work in theoretical computer science; and Frans Pretorius, a professor of physics, who was honored in physics for seminal contributions to the numerical solution of the equations of general relativity.

The award honors the foundation's chairman, James Simons, a renowned mathematician and investment strategist whose work on measurements known as Chern-Simons invariants has been highly influential in theoretical physics.

National Academy of Sciences

William Bialek, the John Archibald Wheeler/Battelle Professor in Physics and the Lewis-Sigler Institute for Integrative Genomics (2012)
Pablo Debenedetti, the Class of 1950 Professor in Engineering and Applied Science; vice dean of the School of Engineering and Applied Science (2012)
David Gabai, the Hughes-Rogers Professor of Mathematics (2011)
John Groves, the Hugh Stott Taylor Chair of Chemistry (2012)
Sara McLanahan, the William S. Tod Professor of Sociology and Public Affairs (2011)
Nai Phuan Ong, the Eugene Higgins Professor of Physics (2012)
Loren Pfeiffer, senior research scholar, electrical engineering (2011)
H. Vincent Poor, dean of the School of Engineering and Applied Science and the Michael Henry Strater University Professor of Electrical Engineering (2011)

Simons Foundation Fellowships

Michael Aizenman, professor of physics and mathematics (2011)
Steven Gubser, professor of physics (2011)
Janos Kollar, the Donner Professor of Science and professor of mathematics (2011)
Elliot Lieb, the Eugene Higgins Professor of Physics (2011)
Paul Steinhardt, the Albert Einstein Professor in Science (2011)
Salvatore Torquato, professor of chemistry and the Princeton Institute for the Science and Technology of Materials (2011)

Society for Industrial and Applied Mathematics

Philip Holmes, the Eugene Higgins Professor of Mechanical and Aerospace Engineering (2011)
Naomi Leonard, the Edwin S. Wilsey Professor of Mechanical and Aerospace Engineering (2012)
Robert Vanderbei, professor of operations research and financial engineering (2012)

Turing Centenary Research Project: Turing Fellow

Mark Braverman, assistant professor of computer science (2012)