Nine Harvard faculty among 47 named Pioneers, Innovators by NIH

By Alvin Powell
Harvard News Office

Nine Harvard faculty members are among 47 scientists nationally whose promising and innovative work was recognized Monday (Sept. 22) with the announcement of two grant programs through the National Institutes of Health (NIH).

The grants, expected to total $138 million over five years for all recipients, recognize established researchers through the Pioneer Award and young scientists through the New Innovator Award.

The awards support potentially high-impact research whose approaches have the potential to transform biomedical and behavioral science.

"Nothing is more important to me than stimulating and sustaining deep innovation, especially for early career investigators and despite challenging budgetary times," said NIH Director Elias A. Zerhouni. "These highly creative researchers are tackling important scientific challenges with bold ideas and inventive technologies that promise to break through barriers and radically shift our understanding."

Zerhouni said the programs are central to NIH's efforts to encourage novel investigator-initiated research and to support more investigators early in their careers.

Pioneer Awards provide $2.5 million in direct costs to established investigators over five years. The New Innovator Awards provide $1.5 million for direct costs over five years to researchers who have not received an NIH regular research grant in the past.

Harvard faculty members who won Pioneer Awards are:

■ Charles M. Lieber, the Mark Hyman Jr. Professor of Chemistry in the Faculty of Arts and Sciences, will develop interfaces between nanoelectronic devices and cells to create new biomaterials and tools for studying the brain. His group's initial focus under

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File Justin Ide/Harvard News Office

Physicist Lene Hau's manipulation and controlling of light could be of great importance for next-generation computing and lead to practical applications in optical networks and quantum cryptography.

Hau awarded prestigious Ledlie

Occasional prize goes to one who makes 'the most valuable contribution to science'

By Michael Patrick Rutter
SEAS Communications

In early 2007, Lene Hau's "trick of the light," stopping and switching off a light pulse in one part of space and then rekindling it in another location, gave the public and experts alike pause — just enough time to let in wonder.

The media latched on to metaphors, from the sublime ("evokes the magic of carrying moonbeams in a jar") to the poetic ("visions in the dark of light") to the pedestrian ("it's like three-card Monte"). A colleague in physics, John Preskill of the California Institute of Technology, even composed a poem in honor of Hau ("But Lene Hau has built a nest/Where tired light can stop to rest").

The pursuit of such scientific wizardry led the President and Fellows of Harvard College to award Hau, Mallinckrodt Professor of Physics and of Applied Physics, the George Ledlie Prize.

"I am very honored to receive the prize. It is really wonderful to receive this kind of recognition from your home institution," said Hau.

The physicist's fascination with the nature of light resulted in several breakthroughs during the past decade. In 1999, Hau slowed light down to 38 mph, or about the speed of a racing bicycle, by shooting a laser beam through incredibly cold atoms. Two years later she one-upped her own finding, bringing light to a complete standstill before restarting it and sending it once again on its path.

"The highly original discoveries of Lene and her lab remind all of us who pursue research of those 'ah-ha' moments that led us into the profession in the first place," said Frans Spaepen, interim dean of Harvard's School of Engineering and Applied Sciences (SEAS) and John C. and Helen F. Franklin Professor of Applied Physics. "I hope her success encourages the next generation of innovators to be bold, take risks, and go after the fundamental questions that really inspire them.

As with Hau's latest discovery of exchanging light and matter, the work has life beyond the lab. Manipulating and controlling light could be of great importance for next-generation computing and lead to practical applications in optical networks and quantum cryptography.

"This feat, the sharing around of quantum information in light-form and in not just one but two atom-forms, offers great encouragement to those who hope to develop quantum computers," said Jeremy Bloxham, dean of science in the Faculty of Arts and Sciences.

"Lene's work is path-breaking," added Harvard's Provost Steven E. Hyman. "Her research blurs the boundaries between basic and applied science, draws on the talent and people of two Schools and several departments, and provides a literally glowing example of how taking daring intellectual risks leads to profound rewards."

Hau, a recently elected member of the Royal Swedish Academy of Sciences and a 2001 MacArthur "Genius" Fellow, received her B.S., M.S., and Ph.D. degrees from the University of Aarhus in her home country of Denmark. Her Ph.D. work was in theoretical solid state physics, a field completely different from that of her later work with ultracold atoms.

In 1989, she received the prestigious J.C. Jacobsen Anniversary Fellowship, awarded by the Carlsberg Foundation of Denmark. She came to Harvard as a postdoctoral fellow to pursue research with Jene Golovchenko, Rumsford Professor of Physics and Gordon McKay Professor of Applied Physics, who held positions at Harvard and the then-independent (and now FAS-run) Rowland Institute of Science. In 1991 Hau became a member of the scientific staff and was given her own lab at Rowland; eight years later she was appointed as a tenured member of the Harvard faculty.

Hau's current research space, easily recognizable by the 'Day-Glo' orange and yellow colored walls, is located in the Cruft and Lyman Laboratories of SEAS and the Physics Department.

"The experiments we do require an intense focus and often run late into the night," said Hau. "They require teamwork, and it has been a great experience to work

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NEWSMAKERS

Courtesy of James Ackerman

Historian of Renaissance architecture James S. Ackerman

Ackerman awarded Golden Lion for contributions to architecture

The 2008 Venice Biennale award committee has conferred on **James S. Ackerman**, the Arthur Kingsley Professor of Fine Arts *Emeritus* at Harvard University, its prestigious Golden Lion for Lifetime Achievement. The award citation praised Ackerman's contributions to architecture, calling him "the doyen of the international community of historians of Renaissance architecture," adding, "He is one of the scholars to have created the modern history of architecture, founded on a systematic approach and making use of a critical examination of all written and visual sources."

As an author, Ackerman is perhaps best known for his influential book "Palladio" (1966), which investigates the impact of this historic figure. Ackerman is a member of the British Academy, the Royal Academy of Arts, the Centro Internazionale di Studi di Architettura in Vicenza, and the Ateneo Veneto end of the Accademia di San Luca in Rome.

Pardis Sabeti awarded Packard Fellowship

The David and Lucile Packard Foundation has recently awarded **Pardis Sabeti**, an assistant professor in the Center for Systems Biology at Harvard University, its Packard Fellowship for Science and Engineering. The $875,000 fellowship will be paid over five years beginning in November. As one of 20 Packard Fellows selected, Sabeti will be invited to an annual conference in September 2009 to meet with other fellows, as well as with the advisory panel and members of the foundation's board of trustees.

— Compiled by Andrew Brooks

Ledlie

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with [the] bright and dedicated young people — students and postdocs — we have here at Harvard. ... They keep you on your toes!"

The Ledlie Prize is awarded no more than once every two years to someone affiliated with the University who "since the last awarding of said prize has by research, discovery or otherwise made the most valuable contribution to science, or in any way for the benefit of mankind."

Read 'Light and matter united,'
www.news.harvard.edu/gazette/2007/02.08/99-hau.html

Robert B. Woodward, the Morris Loeb Professor of Chemistry, was the first recipient in 1955. Other winners have included Judah Folkman, the Julia Dyckman Andrus Professor of Pediatric Surgery; Douglas Melton, the Thomas Dudley Cabot Professor of the Natural Sciences; Gerald Gabrielse, the George Vasmer Leverett Professor of Physics; and most recently, in 2006, Lakshminarayanan Mahadevan, Lola England de Valpine Professor of Applied Mathematics at SEAS.

Julie Russell/Office of Community Affairs

Is it ticklish?

Junseo Kang, 3, looks on as father Jaewook Kang points out a specimen in the Hall of Mammals at the Harvard Museum of Natural History on 'Community Day at the Museums,' when University museums open their doors free of charge to the public.

NIH

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its Pioneer Award will be on developing new nanoscale electrophysiology tools for measurement of electrical and biochemical signaling in brain tissue and cultured neural networks. These nanoelectronic tools could help in understanding the behavior of cellular networks. Lieber also aims to develop sophisticated cell/tissue interfaces for prosthetics and other medical devices, and to create two- and three-dimensional functional biomaterials capable of processing electronic and biochemical signals.

■ Tom Maniatis, the Jeremy R. Knowles Professor of Molecular and Cellular Biology in the Faculty of Arts and Sciences, studies the basic mechanisms of gene regulation in the brain. His Pioneer Award will support research using stem cells in conjunction with the tools of molecular and cellular biology to examine the genesis of Lou Gehrig's disease, also known as amyotrophic lateral sclerosis (ALS). Little is known about the causes of this neurodegenerative disease that affects motor neurons. New techniques make it possible to use ordinary skin cells from patients to generate stem cells that can, in turn, give rise to motor neurons. Maniatis and colleagues plan to study patient-derived motor neurons in cultures to gain insights into the origins of ALS, which may lead to the development of new drugs to treat this incurable disease.

■ Hongkun Park, professor of chemistry and of physics in the Faculty of Arts and Sciences, will develop new nano- and microelectronic tools to study the design principles of the brain. Neuronal networks — collections of neurons interconnected by synaptic junctions — form the physical basis of our brains. Over the years, neuroscientists have learned a lot about individual neurons and have studied whole brains using MRI and other imaging techniques. However, the relationship between connectivity among multitudes of neurons and brain function is poorly understood. Park will develop tools that can perturb and record each and every neuron in a slice of functioning brain simultaneously, in real time. These tools will enable scientists to investigate how synaptic connectivity translates to network function, helping to unravel the design principles of the brain. These tools will also allow cell network-based diagnostics of neurodegenerative diseases.

■ Aravinthan D.T. Samuel, associate professor of physics in the Faculty of Arts and Sciences, will develop new biophysical and imaging techniques to understand the neural basis of behavior in fruit fly, or *Drosophila*, larvae. The project reflects Samuel's longstanding interest in the molecular and cellular underpinnings of purposeful behavior, dating back to his studies as a Harvard undergraduate and graduate student — with biophysicist Howard C. Berg — of how *E. coli* detects and swims toward food. Samuel's own lab studies the neural basis of navigational behaviors in the nematode *Caenorhabditis elegans*. With a brain containing some 3,000 neurons, the fruit fly represents a big step up in complexity. Samuel and his colleagues will examine larval behavior using a biophysical approach, building new microscopes to noninvasively measure neural activity in large numbers of neurons of freely moving larvae as they execute their normal behaviors.

■ Ann Hochschild, a professor of microbiology and molecular genetics at Harvard Medical School, will use bacterial systems to study infectious particles called prions, which are behind some of the worst neurodegenerative diseases, including bovine spongiform encephalopathy, known as "mad cow disease," and its human equivalent, Creutzfeldt-Jakob disease. The ailments are caused when the prion protein goes awry, initiating the formation of self-propagating aggregates within the brain, and causing a fatal collapse of neurological capabilities. Hochschild will look for prions in bacteria, using an *E. coli*-based genetic detection system. Since bacterial systems represent cellular life stripped down to the essentials, *E. coli* would provide a perfect model for studying prion proteins at their most basic level, Hochschild said. "For understanding disease, it's important to understand the fundamental biology of the system. If prion proteins are found in bacteria, we will undoubtedly learn many relevant things about the underlying biology of prion formation."

Faculty members receiving New Innovator Awards are:

■ William M. Shih, an assistant professor of biological chemistry and molecular pharmacology at Harvard Medical School and the Dana-Farber Cancer Institute, is working to develop tools for atomic-resolution imaging of membrane proteins to enable structure-based drug design.

■ Amy J. Wagers, an assistant professor of stem cell and regenerative biology in the cross-School Department of Stem Cell and Regenerative Biology and an assistant professor of pathology at Harvard Medical School and the Joslin Diabetes Center, will study the mechanisms by which aging impairs blood cell function and develop strategies to prevent or reverse these age-acquired defects.

■ Sean M. Wu, an instructor in medicine at Harvard Medical School and Massachusetts General Hospital, will employ mechanisms of embryonic development to engineer functional tissues for organ regeneration using pluripotent stem cells from different species.

■ Samara Reck-Peterson, an assistant professor of cell biology at Harvard Medical School, has been awarded an NIH New Innovator Award to get under the hood of molecular motors inside cells and to discover how they perform some of their most basic functions. Cells are hardly the viscous blobs of protoplasm we often imagine they are. If anything, they're more akin to micro-scaled industrial factories jam-packed with workers and machines, operating with mind-boggling efficiency. Central to these processes are molecular machines, tiny motors that do much of the cell's heavy lifting.

Reck-Peterson will use the fungus Aspergillus as a model organism and focus on two motors called dynein and kinesin, so important that "We would die without them," according to Reck-Peterson. "But there is still so much we don't know about them. How do they move? How do they find the right cargo? How do they carry it? How do they get to where they need to go?"

APPOINTMENT

Mooney, Howe named associate deans at SEAS

Frans Spaepen, interim dean at Harvard's School of Engineering and Applied Sciences (SEAS) and John C. and Helen F. Franklin Professor of Applied Physics, recently appointed bioengineers **David Mooney** and **Rob Howe** as associate deans in SEAS.

The Gordon McKay Professor of Bioengineering, Mooney will serve as the associate dean for applied chemical/biological sciences and engineering, and Howe, who is the Gordon McKay Professor of Engineering, will serve as associate dean for academic programs.

As associate dean for applied chemical/biological sciences and engineering, Mooney will help to manage academic and course planning and faculty and staff searches; handle promotion reviews for faculty appointments; and represent SEAS to the Faculty of Arts and Sciences committee on appointments and promotion. Howe will help coordinate educational policy and cross-School programs and teaching; and oversee lecturer and visiting scholar appointments, executive education, and international programs.

— Andrew Brooks

IN BRIEF

CfA to host focus group on aesthetics and astronomy

The Harvard-Smithsonian Center for Astrophysics (CfA) is sponsoring a focus group survey on Dec. 3 at Phillips Auditorium, 60 Garden St., to gather information on how NASA scientists create astronomical imagery. CfA experts will be on hand for the 3 p.m. talk and discussion. Astronomy enthusiasts are invited to register for the survey, which will last approximately 15 minutes, at http://astroart.cfa.harvard.edu/focus/. Food, drinks, and souvenirs will be provided for all participants. For more information, visit http://astroart.cfa.harvard.edu/.

CHGE releases new 'Healthy Harvest' guide

The Harvard Medical School's Center for Health and the Global Environment (CHGE) recently published "Healthy Harvest: Regional Food Guides for New England and Mid-Atlantic States." These comprehensive guides (available at www.healthyharvest.org) include detailed information about when produce is available regionally both fresh and from storage, as well as food-specific information on varieties, nutritional content, how best to prepare each food item, and tips on how to store the produce. The Healthy Harvest site also includes a growing collection of recipes from some of the nation's top sustainable cuisine chefs and makes a strong case, both for one's health and for the environment, about the importance of eating local food in season.

For printed copies of the guide, e-mail the center at chge@hms.harvard.edu or submit a request on www.healthyharvest.org. Additionally, for a list of upcoming events and appearances sponsored by CHGE, including an Oct. 3 talk at the Museum of Science, visit http://chge.med.harvard.edu.

— Compiled by Andrew Brooks