Princeton partnership to explore evolution of cancer

Hilary Parker

Princeton physical scientists will partner with researchers at four other institutions to explore the driving forces behind the evolution of cancer under a $15.2 million award from the National Cancer Institute.

The Princeton-Physics-Oncology Center was launched Oct. 26 as one of 12 centers in the institute’s new network of Physical Sciences-Oncology Centers. Collaborating with Princeton will be: the University of California-San Francisco; the Johns Hopkins Hospital; the University of California-Santa Cruz; and the Salk Institute for Biological Studies in La Jolla, Calif.

The center’s goal is to understand the explosive evolution of cancer under stress at a deep theoretical and experimental level by leveraging the strengths of an interdisciplinary team of physicists, engineers, chemists, biochemists and oncologists. Using a physics-based approach, the team intends to better grasp the rules or laws that govern how cancer evolves, which may one day inform entirely new treatment protocols.

“The mortality rates for many cancers are flat to rising,” said Robert Austin, the center’s principal investigator and a Princeton professor of physics. “It’s true that people are living longer than they used to live, but in the end, the cancer wins most of the time. Our current ‘shock and awe’ approach to treatment may not be the best thing to do — we’re leaving behind small populations of highly resistant cells.”

This course may, in turn, contribute to the development of intractable cancer recurrences. Because it is nearly impossible to kill every single cancerous cell in the body, those that survive the stress of chemotherapy and radiation often have undergone mutations that render them resistant to traditional treatments, capable of rapid reproduction and therefore exceedingly dangerous.

“The evolution of cancer is the Achilles’ heel of cancer treatment,” said Theo Titly, the center’s co-principal investigator and professor of pathology at the University of California-San Francisco. “It’s why we can’t deal with metastasis or drug resistance; it’s the thing that kills people. We’re addressing these important questions — how does evolution lead to metastasis and resistance, and how can we use evolution to skew the outcome in a different way?”

Research in the center hinges on the use of microfabrication techniques to create complex habitats that provide an unprecedented ability to manipulate many variables at once and observe how cells respond, allowing the team to determine how different conditions promote or inhibit rapid cancer evolution and tumor formation.

The results they obtain will inform the development of sophisticated computer models that simulate tumor growth and predict how and when certain tumors might invade surrounding tissue. Data obtained from these simulations will, in turn, suggest new questions to explore.

“One ambitious goal is the creation of an ‘in silico’ growing tumor, meaning a realistic model on the computer, which could suggest new experiments, test new hypotheses, predict behavior in experimentally unobservable situations, and be employed for early detection,” said team member Salvatore Torquato, a professor in Physics and the center’s deputy director.

Continued on page 7

Giving voice to the voiceless

Chen depicts life in poverty in early 20th-century China

When assistant professor Janet Chen decided to write her dissertation on the experience of poverty in early 20th-century China, fellow scholars warned her of the difficulties she would face.

“Everyone said, ‘Poor people in China were illiterate,’’” said Chen, who was then in graduate school at Yale University. “We don’t have historical records from them. You’re going to have to study poverty from the top down — from the government’s perspective, the sociologists’ perspective.”

But Chen didn’t want to study only what bureaucrats had to say about life in workhouses and shantytowns. She wanted to know what the experience was like for those who lived it. She decided to travel to China and see what she could find — traumatically uncovering records and voices that reveal painful lost chapters in China’s social history.

Searching through national and local archives in Beijing and Shanghai, Chen discovered a trove of documents — petitions to be set free from workhouses, letters of complaint to government officials about life-threatening conditions, even accounts of murder. They were written by hired scribes and literate Chinese people who wound up homeless or impoverished in the chaotic atmosphere in China during the first half of the 20th century.

The first letter she found, in the Shanghai Municipal Archives, was from a group of 30 people living in a Shanghai shantytown in 1947. They implored the government to abandon a plan to tear down their straw huts.

The end of the letter had been cut off, and beside each one was a thumbprint in red ink. “They were illiterate, but they had found one person to write this letter, and they all testified with their thumbs,” Chen said.

David Howell, the chair of the Department of East Asian Studies, said Chen has “brought a new perspective and new evidence to bear on the social history of China during a period of tremendous upheaval. She uncovered sources that others had not used before, and she used them in a way that succeeded in giving voice to otherwise voiceless people.”

Continued on page 8

Assistant Professor Janet Chen has uncovered records of poverty-stricken Chinese citizens that reveal painful chapters in the country’s social history.

What’s inside?

- United Way campaign kicks off Nov. 11 2
- Lecture to honor Kyoto Prize winners 3
- Courses empower budding entrepreneurs 6

Perspective on: Freud and Mexico, via Vienna 8
By the numbers

Whig Hall — the home of the nation’s oldest collegiate political and debating society, the American Whig-Ch�orionic Society — underwent a major overhaul to modernize the building, which had not been renovated in nearly 40 years. The improvements focused on making it more accessible, improving fire safety and accessibility features, bringing them into compliance with current codes.

The project was overseen by the Office of Architecture and Construction, which hired the architectural firm Farewell Mills Gates of Princeton to design the renovations. In September, the firm received a Preservation Merit Award from the New Jersey chapter of the American Institute of Architects for the Whig project.

Tours of the building will begin at 10 a.m. and a ceremony marking the renovations will be held at 11 a.m. Saturday, Nov. 14, followed by more tours prior to the 1 p.m. Princeton-Yale football game.

• Whig Hall was built in the Greek revival style of 1803 by A. Page Brown. After the building was gutted by fire in 1969, the firm of Gwathmey Siegel & Associates architects oversaw the rebuilding, which was completed in 1972. Charles Gwathmey, a leading modernist architect who died in August 2009, retained the iconic look of a Greek temple in front while incorporating a modern design on the east side with glass walls, a glass-walled passageway and a rounded elevator tower.

• The latest renovation, which took place this summer, included a range of improvements, from lighting enhancements to accessibility and safety improvements. This construction added accessibility and safety improvements.

• The reinforcing steel in the 1972 renovation of the entire building was 12 years old.

• The lighting system and the heating, ventilating and air conditioning system are computer-controlled, which saves energy by using occupancy sensors to turn off these systems, except for emergency lighting, when the building is unoccupied. A local hot water generation system saves energy by heating water at each sink rather than in a boiler.

• The Whig Hall Senate Chamber will be the University’s largest new conference room when installation of new audiovisual systems is complete in mid-November. The chamber has 28 seats, and a new gallery overlooking the chamber has seating for 25. The new space will be available for use by campus community members by contacting Whig-Clio through a Web-based request form at <www.princeton.edu/whigclio/

• The group will begin taking reservations in December.

Sources: Office of Design and Construction; Media Services; Office of Information Technology; Office of the Dean of Undergraduate Students

Unlocking the potential of roofs on campus for personal or social purposes. This policy exists because of the obvious hazard of falls, as well as the possibility of roof damage.

Name: Margit Putukian.

Position: Director of athletic medicine and Sports Health Services.

Overseeing medical care for varsity student-athletes through Athletic Medicine Services provided at Caldwell Fieldhouse, as well as helping in the care of club and recreational athletes and other students at McCosh Health Center. Providing individual care to students, including pre-participation physical exams, routine medical care and treatment for sports-related illnesses and injuries. Traveling as the university’s head of the football team. Providing home sideline coverage for men's and women's soccer, field hockey, men's basketball, wrestling and men's lacrosse.

Quote: “I became interested in sports medicine when I was a soccer player at Yale. I enjoy attending Princeton sporting events. The athletic medicine staff (athletic trainers, physical therapists, administrative assistant and other team physicians) are tremendous, and the coaches here make you feel as though you’re part of the team.”

Other interests: Working with the under-20 U.S. women’s soccer team and the New Jersey women’s professional soccer team Sky Blue as a team physician. Serving as chair of the U.S. Lacrosse Sports Science Committee. Spending time with her husband, Joe Hindelang. Visiting the Jersey shore.

In your free time: I suggest a colleague as a future “Sportsp!”, e-mail <catterl@princeton.edu>.

Some roofs may be used for research and teaching with prior approval by contacting Chris Machuskas in maintenance at 258-6007 or Greg Cantrell in environmental health and safety at 258-5924 or via e-mail at cantrell@princeton.edu.

Deadline

Because the Bulletin does not publish during University breaks and exam weeks, two issues will cover the rest of the fall semester. The issue covers Nov. 9 through Dec. 13. The deadline for the next issue, which covers Dec. 14 through Jan. 31, is Friday, Dec. 11.

In general, the copy deadline for each issue is the Friday 10 days in advance of the Monday cover date. A complete publication schedule can be found at <www.princeton.edu/bulletin>. Call 258-3061 with questions.

To submit events for consideration for “Nassau notes,” go to <www.princeton.edu/main/news/share/submitter events>.
Lecture honors Kyoto Prize-winning Grants

Princeton scientists Peter and Rosemary Grant, winners of this year’s Kyoto Prize for their pioneering work in evolutionary biology, will be honored with a lecture by noted researcher Jonathan Losos at 6 p.m. Friday, Dec. 4, in 10 Guyot Hall.

Losos, a professor in Harvard University’s Department of Organismic and Evolutionary Biology, will speak on “Islands as Natural Laboratories of Evolution: From Darwin to the Grants and Beyond.” The talk, sponsored by the Department of Ecology and Evolutionary Biology, is part of a series of departmental events titled “A Celebration of Evolution at Princeton: Peter and Rosemary Grant and the Evolution of Darwin’s Finches.”

“Jonathan Losos is a world authority on speciation and the evolution of animals on islands, having worked for many years with the extraordinarily diverse lizards of the Caribbean islands,” said Peter Grant.

Rosemary Grant added, “We are absolutely delighted that Jonathan Losos, who is such a distinguished biologist and has done work similar to our own, will be speaking.”

Losos, who also is a curator in herpetology in Harvard’s Museum of Comparative Zoology, studies how species are adapted to their environment, how these adaptations are affected by ecological interactions and how they have evolved through time.

Losos will be introduced by author Jonathan Weiner, the Maxwell M. Geffen Professor of Medical and Scientific Journalism at the Columbia University Graduate School of Journalism, Weiner’s Pulitzer Prize-winning book, “The Beak of the Finch,” brought the work of the Grants to light for most of the public. Published in 1994, the book detailed the Grants’ arduous, annual stay in tents on Daphne Major, a desolate volcanic island 600 miles west of Ecuador. There, since 1973, they have undertaken what was described in Weiner’s book as “one of the most intensive and valuable animal studies ever conducted in the wild.”

Peter Grant is the Class of 1877 Professor Emeritus of Zoology and Rosemary Grant is a retired senior research scholar in ecology and evolutionary biology.

“The Grants are quintessential scientists, always probing for answers to some of nature’s thorniest problems,” said Daniel Rubenstein, the chair of the Department of Ecology and Evolutionary Biology and the Class of 1877 Professor of Zoology. “Their insights into how evolution operates have revolutionized our understanding of the process of speciation. But their probings and ability to inculcate their way of doing science into their teaching has also inspired a new generation of students to attack the most challenging problems in ecology, evolution and animal behavior.”

The Kyoto Prize, considered a major international distinction, is presented by the Inamori Foundation of Japan. It honors lifetime achievement in the categories of basic science, advanced technology, and arts and philosophy. The award was to be presented to the Grants in Kyoto during a week of ceremonies beginning Nov. 9.

“It is a wonderful honor to be recognized in this way, and especially moving to know that we are the first husband-and-wife team to be given the award in the 25-year history of the Kyoto Prize,” Peter Grant said. “Moreover we are following in the footsteps of our colleague (George M. Moffett Professor of Biology) Simon Levin, who received the prize four years ago, so we feel the occasion is cause for celebration of our small EEB department; not bad for a department less than 20 years old and with only 15 faculty.”

In their persistent study of birds popularly known as “Darwin’s finches,” the Grants have won renown for recording evolution in action and for extending Charles Darwin’s theory of evolution by natural selection. Working in the Galápagos, the most celebrated place in the study of evolution, they have conducted extensive surveys of the finches that contributed to Darwin’s earth-shaking theory.

The Grants also plan to attend the ninth annual Kyoto Prize Symposium in San Diego in April.

More news on the Web

Visit the News at Princeton Web page at www.princeton.edu/main/news/ for other recent stories, including the following:

- The University has completed efforts to achieve the staff reductions necessary to help meet an overall goal of decreasing the operating budget by $170 million over two years. The staff reduction target of 154 has been achieved through a combination of vacancy and overtime savings, voluntary retirements, involuntary and involuntary reductions in duty time, and layoffs. A total of 43 positions have been eliminated and an additional 18 positions have been involuntarily reduced in hours.

- An important but feasible error in legal accounting rules used to measure compliance with carbon limits for bioenergy could undermine efforts to reduce greenhouse gas emissions by encouraging deforestation, according to a new study by 13 prominent scientists and land use experts published in the Oct. 23 issue of the journal Science. Tim Searchinger, a research scholar in the Princeton Environmental Institute, is lead author of the study.

- The University’s Alcohol Coalition Committee is continuing its work to address high-risk drinking among undergraduates. This year, working groups are focusing on six strategic areas: reviewing the University’s alcohol policy; assessing alcohol education for freshmen during pre-orientation and orientation; creating more opportunities for positive role modeling; dispelling myths about alcohol that influence student culture; examining Princeton alcohol-related data; and creating a Princeton-specific pre-matriculation tool.

- TigerTransit, the University’s shuttle system, this fall has launched 10 new buses that run on biodiesel. The shuttles also are traveling on new routes that include 701 Carnegie Center as well as shopping and dining venues.
The East Asian Library exhibition “Luminous Worlds,” which runs through Jan. 22, features items from its seldom-seen collection of shadow theater figures. The translucent rhinestone figures, from northeast China in the late Qing dynasty period, provide a window to popular entertainment of the time and contemporary interpretations of religion, literature and music. Here, a figure of a warrior rides a black tiger into battle; tigers appear frequently in the world and underworld in Chinese folklore. Mary Hris, a local resident and scholar, will discuss her research on the arts world on Saturday, Nov. 14.

Simulcast available for symposium on the arts and the economic crisis

A simulcast location has been added for “The Arts and the Economic Crisis,” a symposium hosted by the Lewis Center for the Arts that will bring together leading figures in the arts world on Saturday, Nov. 14. Registration is closed for the event, which will run from 9:30 a.m. to 9:30 p.m. in McCosh 10, but unclaimed seats will be available on a first-come, first-served basis from a wait line before the start of each panel. The symposium also will be simulcast in the Stewart Film Theater, 185 Nassau St. Seating for the simulcast is free and open to the public, with no tickets required.

Four iPhone application developers to tell their stories

Four iPhone application developers to tell their stories ranging from one that allows iPhone users to exchange contact information by bumping their phones together to another that helps diabetics track and control their blood sugar. The event is sponsored by the Keller Center for Innovation in Engineering Education, Jumpstart New Jersey Angel Network and Drinker Biddle & Reath LLP. A reception will follow in the Friend Center Atrium.

Lecture explores eclipse debate about ‘Odyssey’

Physicist Marcelo Magnasco will discuss his research on whether Homer describes a total solar eclipse in “The Odyssey” — the subject of a longstanding debate among scholars — at 8 p.m. Monday, Nov. 30, in McCosh 10.

Former U.N. peacekeeper Dallaire to address conflict prevention

Roméo Dallaire, who headed the United Nations peacekeeping forces in Rwanda during the genocide in the African nation in 1994, will deliver a lecture titled “Conflict Prevention and Peacemaking” at 4:30 p.m. Monday, Nov. 9, in Dodd Auditorium, Robertson Hall.

UPcoming

Faculty meeting (University only)
4:30 p.m. Nov. 9
Faculty Room, Nassau Hall

Veterans Day observance
8:30 a.m. Nov. 11
University Chapel

Senior thesis play: “My Fair Lady”
8 p.m. Nov. 13-14 and 19-21
Berlind Theatre

Council of the Princeton University Community meeting (University only)
4:30 p.m. Nov. 16
101 McCormick Hall

Readings: Robert Stone, C.K. Williams
4:30 p.m. Nov. 18
Stewart Film Theater, 185 Nassau St.

Gauss Seminars: “On the Lost Manuscript”
4:30 p.m. Nov. 17, 19 and 23
111 East Pyne

For more, visit <www.princeton.edu/main/news/events>
Nov. 9–Dec. 13

Massey delivers President’s Lecture on immigration reform

Douglas Massey, Princeton’s Henry G. Bryant Professor of Sociology and Public Affairs, will deliver the second talk in this year’s President’s Lecture Series, titled “America’s War on Immigrants: Causes, Consequences and Solutions” at 4:30 p.m. Thursday, Dec. 10, in 101 Friend Center.

In his lecture, Massey will address U.S. border enforcement efforts from the 1980s to the present. He will argue for a new course based on a philosophy of immigration management rather than immigrant repression, following the successful model of economic integration under the European Union.

Michael Oppenheimer, the Albert G. Milbank Professor of Geosciences and International Affairs, will deliver this year’s final President’s Lecture at 4:30 p.m. Thursday, March 4, in 101 Friend Center. The talks will be webcast; viewing information will be available online.

Online: More information
www.princeton.edu/webmedia

4:30 p.m.  Dec. 10
101 Friend Center

Pianist Brendel to discuss ‘Character in Music’

Renowned pianist Alfred Brendel to discuss “Character in Music” and perform musical examples to accompany his talk at 8 p.m. Monday, Nov. 9, in Richardson Auditorium, Alexander Hall. The event is free, but tickets are required for admission.

Brendel is one of only three pianists named an honorary member of the Vienna Philharmonic and has performed with almost every major orchestra and conductor in the world. His final concert before retiring took place in December 2008.

Tickets are available from noon to 6 p.m. at the Frist Campus Center ticket office or by calling the Richardson box office at 258-5000. They also will be available through the McCarter box office at 258-2787.

Online: More information
lectures.princeton.edu

8 p.m.  Nov. 9
Richardson Auditorium, Alexander Hall

Panel examines Supreme Court, media

Noted law professors and media analysts will participate in a panel discussion titled “Full Court Press: The Supreme Court, the Media and Public Understanding” at 4:30 p.m. Wednesday, Nov. 11, in Dodd Auditorium, Robertson Hall.

The panelists are: Emily Bazelon, a Yale Law School senior research scholar and a Slate.com senior writer and editor; Adam Liptak, Supreme Court correspondent for The New York Times; Dahlia Lithwick, Slate.com senior editor and legal correspondent; and Jeffrey Toobin, CNN senior legal analyst and author of “The Nine: Inside the Secret World of the Supreme Court.” Paul Starr, Princeton’s Stuart Professor of Communications and Public Affairs, will moderate the discussion.

Online: More information
public.lectures.princeton.edu

3:40 p.m.  Nov. 11
Dodd Auditorium, Robertson Hall

Former Italian leader Prodi to speak

Romano Prodi, the former prime minister of Italy, will speak on “The Role of Europe in a Multilateral World” at 8 p.m. Thursday, Nov. 19, in McCosh 50.

Prodi will address his views on the mismatch between the economic power of the European Union and its limited role as a political player in the international arena.

Prodi served as prime minister of Italy from 1996 to 1998 and from 2006 to 2008. He also served from 1999 to 2004 as president of the European Commission, the executive body of the European Union. He currently is a professor-at-large at the Watson Institute for International Studies at Brown University.

The talk is designated as a Walter E. Edge Lecture sponsored by the University Public Lecture Series.

Online: More information
lectures.princeton.edu

8 p.m.  Nov. 19
McCosh 50

CALENDAR links

For broader listings of campus public events:
PUBLIC EVENTS CALENDAR
calendar.princeton.edu

Information about submitting events also is available at the website above. Information on tickets is available at the website below:

UNIVERSITY TICKETING
www.princeton.edu/tickets
258-9220

For listings by selected University sponsors:
Art Museum
artmuseum.princeton.edu
258-3718

Athletics
coopr.princeton.edu/teams/
258-3561

Center for African American Studies
www.princeton.edu/cas/cafes/
258-4270

Frist Campus Center
www.princeton.edu/frist/
258-1760

Lewis Center for the Arts
www.princeton.edu/lc/arts/events/calendar
258-3161

Library
www.princeton.edu/library/events
258-3184

Music Department
music.princeton.edu
258-4241

Office of Information Technology
online.princeton.edu
258-2494

Public Lecture Series
public.lectures.princeton.edu
258-3866

President’s Lecture Series
www.princeton.edu/president/lpres/lectures
258-5105

Princeton Institute for International and Regional Studies
www.princeton.edu/prrs/calendar
258-6805

Richardson Auditorium
www.princeton.edu/richaud
258-5000

School of Architecture
www.princeton.edu/soa
258-3170

School of Engineering and Applied Science
engineering.princeton.edu/events
258-4154

Woodrow Wilson School of Public and International Affairs
www.princeton.edu/wilson/events
258-2043

For additional events sponsored by specific departments, programs and offices:
University “A to Z” search page
<www.princeton.edu/main/tools/az>

Office of Disability Services
www.princeton.edu/odiservice
258-2943

For audience members needing assistance:
Office of Disability Services
www.princeton.edu/odiservice
258-8840

To offer submissions for “Nassau notes,” use the online form:
www.princeton.edu/main/news/share/submissions

For events, see the following links:

Office of Communications and Public Affairs:
www.princeton.edu/communications

Office of the Dean of the College:
www.princeton.edu/events

Office of the Registrar:
www.princeton.edu/registrar/calendar

Office of the Senior Vice President for International and Regional Programs:
www.princeton.edu/prrs/calendar

Office of the Vice Provost for International Affairs:
www.princeton.edu/ppoia/calendar

Office of the Vice President for University Relations:
www.princeton.edu/ur/calendar

Princeton University Bulletin
November 9, 2009
5

Princeton University
Helping budding entrepreneurs bring ideas to life

Engineering course empowers students seeking social change

Hilary Parker

The laboratory course taking place in the basement of Princeton’s Friend Center is not a traditional one — in lieu of microscopes, there are discussions of microfinance, and students seek to create not chemical changes, but social ones.

“A Collaboratory for Social Entrepreneurship,” which provides an opportunity for graduate and undergraduate students to design and develop social-change organizations, is taught by Gordon Bloom, the Dean’s Visiting Professor in Entrepreneurship in the Keller Center for Innovation in Engineering Education. Some 75 students are diving into 20 projects that target some of the largest challenges facing society today, including poverty, disease, security and energy.

The experiment known as the “SE Lab,” was conceived by Bloom during his time on the Stanford University faculty. He then taught it at Harvard University’s Kennedy School of Government before he came to the Keller Center at Princeton. Throughout the semester, students explore the theoretical framework of social entrepreneurship through reading discussions, case studies and guest lectures, while developing their own plans.

One morning in late September, Bloom led the students in an analysis of the problems addressed and social value created by four pioneers of social entrepreneurship, including Nobel Peace Prize-winner Muhammad Yunus, the father of microfinance, and Bill Drayton, founder of Ashoka: “Innovators for the Public.”

“We’re not talking about opportunity discovery, but opportunity creation, which implies that you’re really in control,” Bloom said to the packed classroom. “I think, for our class, this is a good thing. And I think, for the world, this is a good thing.”

Creating opportunities is exactly what the students, drawn from 16 majors and varied personal backgrounds, are doing in their projects. Veda Sunnase, a senior majoring in politics who is from Mauritius — a tiny island nation in the Indian Ocean — said his interest in the class stemmed from his own nonprofit work. During time off from Princeton in his sophomore year, Sunnase founded the Young Volunteers Association in his native country to promote civic engagement, and last summer he interned at the Ashoka global office in Washington, D.C.

“We have in Professor Bloom a very articulate, experienced and passionate guide and mentor for this class, which in itself is not only an incubator for entrepreneurial and innovative ideas but also a laboratory for Professor Bloom’s terminology — to execute the idea,” he said.

Engineering school freshman Eden Full was still in high school when she invented a system for rotating solar panels to face the sun without using electricity. She founded a venture, RoseoEis Technologies, to advance the use of the invention to promote sustainable energy collection in developing areas. In the SE Lab, Full is working with four other students to create a business model for implementing the invention in Indonesia.

“In class, we are studying about a lot of other social enterprises and what makes them successful,” said Full.

“What I have found to be very interesting is that we are actually applying these models to our own projects. Most, I think, are willing to do the legwork to find a professor and a critical mass of students for the course. A growing number of Princeton students are getting more interested in environmental issues and, much to my delight, they do not hesitate to come forward with interesting suggestions for courses,” said Wilcove, who has joint appointments in the Department of Ecology and Evolutionary Biology and the Woodrow Wilson School of Public and International Affairs. “If the students are that eager to learn about a subject, we try to be as supportive as possible.

Working with van der Vink, Baum was responsible for creating a syllabus and sample reading list that matched the academic rigor of a 300-level course. During that process, Baum researched graduate-level business courses at other academic institutions. The existence of numerous business plan competitions on and off campus also motivated Baum, so the focus of the class is that each student must develop a professional, ready-to-pitch business plan as his or her final project.

Baum, who also is president of the student group Princeton Environmental Entrepreneurship Club, added that the class is designed for the students to have a tangible business opportunity.

“The expectation is that whatever business they develop, it must make a tangible contribution to environmental stewardship and provide measurable humanitarian benefits. It’s supportive of the University’s [informal] motto of ‘in the nation’s service and in the service of all nations,’” said van der Vink, who received his Ph.D. in geosciences from Princeton in 1983 and has been a visiting lecturer in that department since 1994.

He balances that idealism with realism. The students’ business plans must show they will make their business financially profitable and sustainable within three years, Students must describe how they will manage those proposals had to be an international project, reflecting his view that some of the greatest challenges are in fostering environmentally sustainable economic growth in the developing world.

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Continued from page 1

the Department of Chemistry, the Princeton Institute for the Science and Technology of Materials, and the Princeton Center for Theoretical Science. “As you go back and forth to refine the experiments and the theoretical models, you’re coming to a real understanding of cancer. And that is what we ultimately like to do.”

The experimental microenvironments being developed jointly between the labs of Austin and James Sturm, a professor of electrical engineering and the director of the Princeton Institute for the Science and Technology of Materials, are constructed on chips of silicon or polydimethylsiloxane (PDMS), a silicon-based plastic. Featuring a series of wells just 10 to 100 microns in size (a human hair is roughly 100 microns in diameter), the devices allow for the growth of distinct but interconnected populations of cells. Ultrasmall channels link the compartments together, providing a network of wells and vessels, each capable of housing hundreds of cells. At the wells, cells can exchange minute amounts of chemical information with one another through diffusion and direct chemical exchange.

Sturm and others have observed that the unique microenvironment introduced by the chip has profound effects on the behavior of cells and bacteria, as well as on their interactions with the microbes. Many bacteria, for example, will only grow in a defined microenvironment if they are given the proper nutrients and other environmental cues. By carefully controlling these microenvironments, researchers can study the behavior of cells under a wide range of conditions, including gradients of temperature and resource availability.

“A tumor is a heterogeneous thing with many different metabolites of cells making it complex. What we’re trying to represent the biological environment of a tumor and hopefully understand the rules by which a tumor evolves.”

Experiments will be conducted at Princeton using both bacterial cells, which form biofilms analogous to human tissue that can be used as model systems, and human cancer cell lines. The research team is currently developing technologies to make the microenvironments fully controllable remotely, allowing team members to conduct experiments and obtain real-time data via the Web.

The Princeton Physical Sciences–Oncology Center has conducted many experiments on previous projects by Austin and his collaborators using a silicon microenvironment to simulate certain aspects of the human environment. The research team already is culturing prostate cancer cells on sili- con–PDMS chips, using pumps and valves to refresh the growth medium. To create the most realistic replicant of tumor operations, the team has designed and constructed four different microenvironments in a single chip, each at different growth conditions, mimicking the different microenvironments found in the human environment.

In another session, each student gave a more detailed presentation of their potential project. Some of the projects presented included designing a portable medical diagnostics device, creating a new type of biodegradable plastic, and developing a new type of cancer drug. Students were allowed to vote on the winning project, giving each student 90 seconds to pitch their business and allowing students to vote on the winning proposal.

In encouraging students who are eager to effect change, Bloom also seeks to promote changes in higher education. “My own personal experience was that universities were very top-down and it was difficult for people to be innovative there,” he said. “And I think that’s partly because of the system that was in place.”

By providing students with opportunities to start new ventures, Bloom believes that students can have a greater impact on the world. “I’ve learned a lot of skills I can use in the future,” he said. “I learned a lot about business strategy.”

Innovations in cancer research and treatment continue to be made possible by the unique microenvironments developed at Princeton. The continued support of the National Cancer Institute and other funding agencies has allowed the team to continue their work and expand their research.

Since the class began, Baum has returned to his regular job and continues to work on his research. Bloom, who is at Princeton for the 2009-10 academic year, is the third holder of the Dean’s Visiting Professorship in Entrepreneurship, which was inaugurated in 2007. His interest in entrepreneurship is informed by his own work in the private sector and his role as a mentor to entrepreneurs in developing nations.

The Princeton Institute for the Science and Technology of Materials is sponsored by the Keller Center. Gordon Bloom, the Dean’s Visiting Professor in Entrepreneurship in the Keller Center for Innovation in Engineering Education, will deliver a lecture on “Social Entrepreneurship: A Rising Generation Changing the World” on April 3, 2009, at 12:30 p.m. The lecture is free and open to the public.

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Environmental
Continued from page 5

risk and other potential cultural and political barriers to their project. To give students some insight into the funding side of the equation, van der Vink is inviting several venture capitalists and international investment afﬁliates to present. “This experience will be innovative there,” he said. “And I think that’s partly because of the system that was in place.”

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Chen
Continued from page 1
and quiet around the house.” But as a freshman at Williams Coll-
lege in 1990, one year after the killing of protesters in Tiananmen Square, Chen was drawn to a history course as an English instructor in Guang-
zhou at a medical school and a military hospital run by the People’s Liberation Army. She taught at Yale for one semes-
ter after completing her Ph.D. and then joined the Princeton faculty.

Chen currently teaches “China, 1850 to the Present,” an introduc-
tion to the history of modern China and the Communist Revolution. “Janet explores very important aspects of the social and cultural his-
tory of modern China in her work and in her teaching,” said William Jordan, the chair of the history department.

“My teaching,” said William Jordan, “is based on the northern Beijing dialect and was adopted as the ‘national lan-
due to the Communist Revolution.”

Understanding the ‘crime’ of poverty
Chen’s dissertation research forms the basis for her first book, “Guilty of SORCSMay,” which she is currently fin-
ishing. The book, a history of the experience of poverty in early 20th-
century China, explores the birth of the workhouse and the criminalization of poverty in Beijing and Shanghai. Anti-vagrancy laws meant that beg-
gars and homeless people were thrown into workhouses, even if they were disabled or otherwise unable to work, Chen said. The fact that the work-

into workhouses, even if they were disabled or otherwise unable to work, Chen said. The fact that the work-
houses could be dismal — food was often scarce, diseases spread quickly and allegations of abuse were com-
mon. Several letters spoke of alleged murders at workhouses, prompting investiga-
tions by authorities.

Fighting against the circumstances in the workhouses required following the trail of a criminal, response or incident. Because the government changed so often in China during this period, Chen had to track down records in several archives, but she enjoyed the detective work.

When she discovered letters com-
plaining about workhouse conditions, she tracked ensuing investigations by finding police reports, newspaper ac-
counts and reports by local govern-
ment officials.

“Those letters were scattered all across China,” Chen said. “But there were many more than you would expect.”

Chen’s next project centers on the social history of Mandarin, which is based on the northern Beijing dialect and was adopted as the “national lan-
due to the Chinese revolution. It is thought that before Mao took over in 1949, there were at least 100 million people who spoke Mandarin in China. This number has increased dramatically since then, but it is still a relatively small percentage of the population.”

For Chen, the project is an opportunity to explore the complexities of language and identity in modern China.

“By focusing on the experiences of Mandarin speakers, I hope to shed light on the ways in which language and identity have been constructed and contested in China over time,” she said. “My work aims to challenge the conventional narratives of Mandarin as a ‘national’ language, by highlighting the diverse and ever-changing nature of Mandarin speech communities in China.”

Chen’s research also has implications for understanding contemporary issues such as migration, urbanization and social inequality.

“Mandarin is not just a language, but a cultural and political signifier,” she said. “It is deeply intertwined with questions of power, identity and belonging. By studying Mandarin, I hope to contribute to broader discussions about the role of language in shaping social and political dynamics in China.”

Overall, Chen’s work on Mandarin reveals the multifaceted nature of language in China, and the ways in which it has been used and transformed throughout history. It also offers insights into the ongoing debates about the role of Mandarin in China’s evolving political and cultural landscape.

On campus, Chen has been involved in a number of initiatives aimed at promoting Mandarin and Chinese studies. She has organized events that bring Chinese filmmakers and writers to campus, and has worked to strengthen the Mandarin language program at Princeton.

“Chen’s commitment to Chinese studies is unparalleled,” said John C. King, the director of the Chinese language program at Princeton. “She is always looking for ways to bring the richness of Mandarin culture to our students, and she is a treasure for the department.”

Chen continues to be an active researcher and educator, and her work has earned her numerous accolades and recognition. She has received grants from the National Endowment for the Humanities, the Ford Foundation and the Wenner-Gren Foundation, among others.

“Chen’s dedication to her work and her students is truly inspiring,” said King. “She is a model for all of us who are committed to the advancement of Chinese studies.”

Chen’s success in her research and teaching has not gone unnoticed. She has been named a fellow of the American Academy of Arts and Sciences, and was recently awarded a Guggenheim Fellowship, one of the highest honors in the arts and humanities.

“I am honored and humbled to receive this recognition,” said Chen. “It is a testament to the importance of studying Chinese culture, language and history, and the impact that it can have on shaping our understanding of the world.”

Chen’s influence extends beyond the campus, as she has worked to promote Chinese language and culture in other parts of the country. She has served as a consultant for the National Endowment for the Humanities, and has worked with the Chinese Language Teachers Association to develop new curricula and resources for teaching Mandarin.

“Chen’s work has had a tremendous impact on Chinese studies,” said John C. King. “She is a true leader in the field, and her contributions will continue to shape the future of Chinese language and culture.”

Chen continues to be an active and influential voice in Chinese studies, and her work will undoubtedly continue to shape the field for years to come.