PRINCETON UNIVERSITY BULLETIN
Volume 101, Number 5 Jan. 16, 2012

New approach connects art and experience at museum

Ruth Stevens

Strolling through the Princeton University Art Museum, a visitor readily notices the resemblance: The elongated man's head in a 20th-century Italian painting is shaped exactly like a nearby decorated weaving loom pulley from 19th-century West Africa.

It is no coincidence that these pieces resonate visually with each other — or that they are now displayed together in the art museum. It is part of a new approach the museum is taking to showcase its 72,000 objects, intended to make the collections more accessible to patrons by drawing connections and providing additional context and background.

The museum recently reinstalled its galleries of European and American art from the medieval period to the present. These 13 galleries now bring together well-known favorites with new acquisitions and mix works across media. The technique enables the museum to draw on the depths of its holdings to tell richer and fresher stories.

"We wanted to create new opportunities to rotate works through the collections galleries on a more regular basis and to somehow break down the boundaries between different areas of the collections," said James Steward, who has championed the new method since joining the museum as its director in 2009.

"For pragmatic reasons, we thought it would be interesting to create some new juxtapositions across collections, across cultures," he continued. "Intellectually, it felt to us that this would bring our practice as a museum much more in line with what has been happening in the broader academy for the last 20 or more years: crossing disciplinary borders more regularly, looking to find the connection between and through disciplines, and to speak to points of cultural contact."

For example, in one gallery some paintings by 20th-century Italian artist Amedeo Modigliani are shown near a case containing several 19th-century heddle pulleys, which resemble small portrait masks, from weaving looms of the Baule and Guro people from what is now the Ivory Coast.

Caroline Harris, curator for educational and academic programs, said that Modigliani was heavily influenced — like many artists working in Paris in the early 20th century — by African art. She points, in particular, to a portrait on display of poet, playwright and future filmmaker Jean Cocteau by Modigliani.

"It shows the translation into his painting of the aesthetics of African sculpture," she said. "It's lovely that we have these heddle pulleys in association with the Modigliani because this is exactly the sort of African art that he was looking at and was interested in. And when you look at the treatment of the face — the way that the eyebrow is related to the nose, the elongation of the face and the chin, and the somewhat diamond-shaped mouth — all of those stylizations of the features really resonate with the African objects."

Steward said that the goal of the new way of displaying objects is to

Continued on page 8

Video still by Nick Barberio

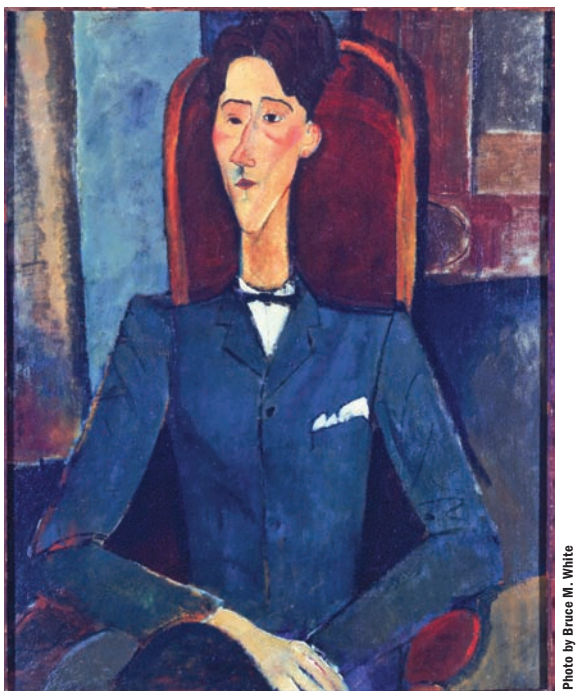


Photo by Bruce M. White

The Princeton University Art Museum is taking a new approach to showcase its 72,000 objects, bringing together well-known favorites with new acquisitions and mixing works across media. African art, such as these decorated loom pulleys (left) from 19th-century West Africa, has been displayed near art it has inspired, including this early-20th-century oil painting, "Jean Cocteau" (right), by Italian artist Amedeo Modigliani.

Concussion research aims to help athletes, brain studies

Emily Aronson

It's called an invisible injury, yet it affects hundreds of thousands of athletes each year. From professional boxers, college football stars, high school soccer players and kids competing in schoolyard baseball games, concussions can be a significant injury for anyone playing sports.

To address the problem, Princeton researchers Annegret Dettwiler-Danspeckgruber and Margot Putukian have spent the past four years studying sports-related concussions, aiming to improve diagnostic tools and help better determine when it's safe for athletes to return to play. Their work is ongoing, but by bridging neuroscience and sports medicine, they are seeking not only to support athletes, but also to illuminate the study of both brain structure and function following concussion.

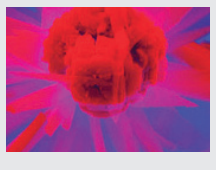
Dettwiler, an associate research scholar at the Princeton Neuroscience Institute, and Putukian, the director of

Continued on page 7

Photo by Denise Applewhite

Margot Putukian, director of athletic medicine and head team physician for University Health Services, says that engaging students to participate in research helps reinforce growing awareness about the seriousness of concussions and the importance of early intervention.

What's inside?



Klaus appointed to new post as VP for University Services

Emily Aronson

Chad Klaus, a member of Princeton's Facilities Organization staff for 11 years, has been named vice president for University Services. The newly created position is part of a realignment of the responsibilities within Facilities and University Services to strengthen the University's capacity to manage its facilities and provide critical services to members of the campus community.

Klaus

Reporting to Executive Vice President Mark Burstein, Klaus oversees University operations that provide daily services for faculty, staff and students. He also will serve as a member of the president's cabinet.

"I believe Chad will be an excellent vice president for University Services. His leadership of the University's efforts to revitalize residential college dining, implement the Housing Master Plan, and redesign our faculty and staff home ownership programs clearly illustrate he is ready for the challenges that lie ahead," Burstein said.

"Along with Assistant Vice President for University Services Paul Breitman and office directors, Chad will create an organization well positioned to build on the recent improvements in campus services," he added.

In his new role, Klaus supervises the offices of Conference and Event Services; Contract Management and Trademark Licensing; Dining Services; Frist Campus Center; Housing and Real Estate Services; Print and Mail Services; Richardson Auditorium; Transportation and Parking; University Scheduling; and Business, Marketing and Communications for University Services, including TigerCard and University Ticketing.

"I feel honored to be at Princeton and excited about the opportunity to work more closely with Mark, the senior administration and the talented University Services team to serve the campus," Klaus said. "I look forward to creating a new organization that supports Princeton's mission and enhances the daily quality of life for our faculty, students and staff by providing efficient and quality services that meet the diverse needs of our University community."

Klaus previously served as assistant vice president for facilities services, forging partnerships across the University to develop new programs and enhance campus services for faculty, staff and students.

His work included revamping the residential dining program to improve meal options and customer service, as well as co-leading the early arrival initiative to improve safety for returning undergraduates and better allocate University resources at the start of the academic year. He also helped oversee the Housing Master Plan to augment housing options for faculty, staff and graduate students — one of the strategic planning projects he will continue to be involved with in his new position.

Three of the four offices that Klaus oversaw in his former facilities services role — Conference and Event Services, Dining Services, and Housing and Real Estate Services — have moved to University Services, while Building Services remains within Facilities.

As part of the realignment, current Vice President for Facilities Michael McKay continues to lead units within Facilities that are responsible for planning, operating and maintaining the University's physical space. Those offices remaining within Facilities are: the University Architect; Building Services; Design and Construction; Engineering; Facilities Finance and Administrative Services; Grounds and Building Maintenance; Life Safety and Security; Organizational Development and Planning, as well as Picus Associates, which manages the Forrestal Center for the University; Real Estate Development; and Sustainability.

Klaus came to Princeton in 2000 as director of customer service and quality improvement in Facilities. During that time he helped establish the Facilities Customer Service Center, a one-stop concept for requesting services. He also initiated customer and employee feedback mechanisms and worked to strengthen collaboration between departments.

A graduate of Oregon State University, Klaus previously worked in the facilities department there for nine years, ultimately serving as assistant director for marketing and customer service.

Spotlight

Photo by Denise Applewhite

Name: Amanda Pike

Position: Special collections assistant for public services at the Seeley G. Mudd Manuscript Library. Helping remote patrons with historical research using materials from the University Archives. Supervising photo and manuscript duplication services for patrons. Working with students and staff members while overseeing various digitization and scanning projects, including a current project to scan all minutes of 20th-century Board of Trustees meetings. Assisting with exhibitions, including the current Mudd Library exhibition on the history of women at Princeton.

Quote: "I like helping researchers find information in the University Archives and seeing how they make use of the collections. It's great to see that researchers from around the world can access our collections without having to visit the library. I am glad to be able to help identify resources and deliver them to researchers."

Other interests: Spending time with her partner, Mark Schuber, and their dog, Wally. Working on home renovation projects. Traveling. Cooking big dinners with friends.

Faculty obituaries

Sin-I Cheng, a professor emeritus of mechanical and aerospace engineering at Princeton who, in a career spanning five decades, made critical early advances in rocketry and helped develop modern computational approaches to aerodynamics, died Dec. 6 at his home in Princeton. He was 89.

Cheng

Cheng, who earned his Ph.D. in aeronautical engineering from Princeton in 1952 and served on the University faculty for 41 years, developed an early expertise in the stability of liquid propellent rocket engines. He published a highly influential monograph in 1956 with his thesis adviser, Professor Luigi Crocco, describing the fluid dynamics and chemistry that could lead to overly rapid or explosive burning.

The theoretical understanding provided by this rigorous work was essential in paving the way for reliable rockets as the United States hurdled into the space race after the Sputnik launch of 1957, said Sau-Hai "Harvey" Lam, who was a graduate student at Princeton at the time and is now a professor emeritus. "In the early days, rockets very frequently blew up on the test stands," Lam said.

In subsequent years, Cheng made broad contributions to fluid dynamics, the field that includes understanding the flow of fast-moving gases, such as air over a wing. He published more than 100 journal articles and book chapters on subjects such as unsteady boundary layers, reacting gas dynamics, high-speed flows and turbulence.

ONLINE: More information
blogs.princeton.edu/memorial

People

Jacqueline Deitch-Stackhouse, who has more than 13 years of experience in counseling, advocacy and violence prevention, has been named director of Princeton's Sexual Harassment/Assault Advising, Resources and Education office.

Reporting to University Health Services Executive Director John Kolligian, Deitch-Stackhouse oversees the office's victim/survivor-centered approach to sexual harassment, assault and relationship violence throughout the University community, with a primary focus on the well-being of students.

Deitch-Stackhouse

She provides emergency response and immediate advocacy to students affected by sexual harassment and violence, and facilitates consultations to mental health, medical, legal and other resources as needed. She also helps with referrals of students who are accused of sexual misconduct to other University offices, and faculty and staff to those offices or external assistance programs to address matters of sexual misconduct.

ONLINE: More information
www.princeton.edu/main/news

PRINCETON UNIVERSITY BULLETIN

www.princeton.edu/bulletin

Managing editor
Eric Quiñones

Lead designer
Maggie Westergaard

Contributing writers
Emily Aronson, John Greenwald, Steven Schultz, Ruth Stevens, Catherine Zandonella

Photographers
Denise Applewhite
Brian Wilson

Subscription manager
Elizabeth Patten

Deadline

In general, the copy deadline for each issue is the Friday 10 days in advance of the Monday cover date. **The deadline for the next issue, which covers Feb. 13-March 11, is Friday, Feb. 3.** A complete publication schedule can be found at www.princeton.edu/bulletin. Call 609-258-3601 with questions.

To submit events for consideration for "Nassau notes," go to www.princeton.edu/main/news/share/submitevents.

Jeff and MacKenzie Bezos donate $15 million to create center in neuroscience institute

Ruth Stevens

Princeton alumnus Jeff Bezos, the founder and chief executive officer of Amazon.com, and alumna MacKenzie Bezos, are donating $15 million to the University to create a center in the Princeton Neuroscience Institute. The gift will establish the Bezos Center for Neural Circuit Dynamics, which will be led by institute co-director David Tank.

Jeff Bezos was an electrical engineering and computer science major at the University who graduated with highest honors and Phi Beta Kappa in 1986. MacKenzie Bezos was an English major who graduated with highest honors in 1992 and a certificate in creative writing.

"Professor Tank and his colleagues are on an epic quest to unravel one of humankind's greatest challenges — understanding the brain," said Jeff Bezos. "New tools and techniques are making possible discoveries that would have been unthinkable just two decades ago. We can hope for advancements that lead to understanding deep behaviors, more effective learning methods for young children, and cures for neurological diseases. MacKenzie and I are delighted and excited to support Princeton in their focus on fundamental neuroscience."

Princeton President Shirley M. Tilghman expressed her thanks for the gift, noting that the Bezos Center for Neural Circuit Dynamics will bring the University's strengths to bear on a frontier of scientific knowledge that has far-reaching implications for the understanding of behavior and the treatment of neurological disorders.

"I am deeply grateful to Jeff and MacKenzie for so generously supporting this critical initiative," Tilghman said. "The Princeton Neuroscience Institute is grappling with some of the most fascinating questions in the scientific world today, and the Bezos Center will significantly advance our understanding of how the brain works by taking full advantage of Princeton's strong tradition of multidisciplinary collaboration, its pre-eminence in quantitative and theoretical sciences, and its leadership in developing scientific instrumentation."

At the Bezos Center, researchers will be looking for patterns of activity that reveal, for example, how decisions are made or memories are recalled. At the microscopic scale, the brain consists of vast networks of neurons that are wired together with synaptic connections to form neural circuits. Each neuron can have electrical and chemical activity different from that of its neighbors. As neurons become silent or active, the pattern of activity shifts. These changing patterns are called neural circuit dynamics.

The key to understanding how the brain works is to determine how the neural circuits across these networks represent and process information relevant to behavior. In the new center, measurement of neural circuit dynamics will be combined with complementary measurement of how the neurons are wired together with synaptic connections. The measurement of neural connectivity, and the mining of that data for knowledge about the brain, is an emerging field of research known as "connectomics."

"Advances in technology for measuring and manipulating the activity in neurons are revolutionizing our ability to examine how neural circuits operate in the brain," said Tank, the Henry L. Hillman Professor in Molecular Biology. "In parallel, new methods for 'connectomics' are capable of determining the wiring diagram of neural circuits. The new Bezos Center will focus on using these new technologies together to probe basic mechanisms of brain function such as sensory perception, memory and decision-making."

Tank also is co-director with Jonathan Cohen, the Eugene Higgins Professor of Psychology, of the Princeton Neuroscience Institute, established in 2005. The institute already has made significant contributions to the field by building on Princeton's achievements in quantitative and computational approaches, brain-imaging studies and microscopy. It has attracted a top-ranked group of faculty, and established an undergraduate certificate program and a Ph.D. program that are drawing students from around the world.

Work within the Bezos Center will involve collaboration with the Princeton Institute for Computational Science and Engineering, a consortium of scientists and engineers who use high-end computing in their research. In addition, Princeton's theoretical and computational neuroscientists, who excel in producing mathematical descriptions of brain operations, will work side by side with experimentalists, who will test theories of brain function.

The home of the Bezos Center will be within a new complex under construction on the south edge of Princeton's campus near the Icahn Laboratory that will house the Princeton Neuroscience Institute and the Department of Psychology. The facility is expected to open in the summer of 2013.

Because of his pioneering work, Jeff Bezos was selected to speak at Princeton's 2010 Baccalaureate ceremony. He attended the service with his wife, MacKenzie, and spoke to the audience about making choices in life. "Cleverness is a gift, kindness is a choice," he said.

"When you are 80 years old, and in a quiet moment of reflection narrating for only yourself the most personal version of your life story," he said, "the telling that will be most compact and meaningful will be the series of choices you have made."

Princeton offers early action admission to 726 students

Princeton has offered admission to 726 students from a pool of 3,443 candidates who applied through single-choice early action for the Class of 2016.

Princeton's undergraduate admission office mailed notification letters to students Dec. 15.

This is the first year since 2006 that the University has offered an early application round for prospective students whose first college choice is Princeton. The University's early action program requires applicants to apply early only to Princeton, and not to other early programs, but does not require them to decide whether to accept Princeton's offer until the end of the regular admission process in the spring.

"We are thrilled with the academic quality of the accepted students and the range of talents they presented to the committee," Dean of Admission Janet Rapelye said. "In this first year of early action, we received a broad and deep applicant pool, which was one of our goals in deciding to return to an early program. Each application was reviewed carefully and individually, and we had to make some difficult decisions. The accepted early action applicants represent between 31 and 36 percent of the total number of students we expect to admit this year."

Of the students accepted through early action this year, 10 percent are international students, and 37 percent are U.S. students from diverse backgrounds. Fifty percent of the prospective students are men, and 50 percent are women. They represent 30 countries and 42 states, plus the District of Columbia.

Fifty-six percent of the admitted students come from public schools, and 10 percent are the first in their families to attend college. Thirteen percent of the admitted students are sons or daughters of Princeton alumni. Twenty-three percent of the admitted students indicated they want to study engineering.

Sixty-four percent of the early action students applied for financial aid, which under Princeton's groundbreaking "no-loan" policy provides students who qualify for aid with grants that do not need to be repaid.

Candidates deferred during the early action process will be reconsidered during the regular decision application process. Candidates must apply under regular decision by Jan. 1 and will receive notification of their decision by early April.

About 100 of this year's early applicants requested to be moved to the regular decision schedule before early action decisions were made.

Employee retirements

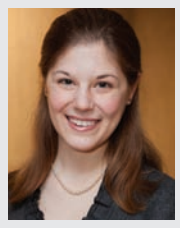
Effective Dec. 1, 2011: in the plasma physics lab, principal research physicist **Janardhan Manickam**, after 36 years; in the plasma physics lab, principal engineer **Robert Simmons**, after 22 years; in the plasma physics lab, principal research physicist **King-Lap Wong**, after 35 years.

Effective Jan. 1, 2012: in gift planning, director **Ronald Brown**, after 15 years; in East Asian studies, senior professional specialist **James Edgren**, after 19 years; in the art museum, security officer **Bob Ilegieuno**, after nine years.

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:

- Senior Olivia Waring, a chemistry major with an interest in Chinese language and translation, has been awarded the 2012 Daniel M. Sachs Class of 1960 Graduating Scholarship, one of the highest awards given to Princeton undergraduates. Waring, a native of Randolph, N.J, plans to use the Sachs award to pursue postgraduate studies in linguistics and philology at the University of Oxford, with an emphasis on Mandarin Chinese and Tibetan languages. Her hope is to help revive disappearing dialects and translate key scientific works into those languages.



Waring

- Author and journalist Michael Lewis, a 1982 Princeton graduate whose best-selling books include "Moneyball," "The Blind Side" and "Liar's Poker," has been selected as the speaker for the University's 2012 Baccalaureate ceremony. Baccalaureate, an end-of-year interfaith service that is one of Princeton's oldest traditions, is scheduled for 2 p.m. Sunday, June 3, in the University Chapel. Princeton President Shirley M. Tilghman selects the Baccalaureate speaker after consultation with senior class leaders. Officers of the Class of 2012 recommended Lewis based on his understanding of life as a Princeton student and his insights into the transformations that have marked many aspects of American society over the past generation.

Lewis

- A Princeton-based research team found that uninformed individuals — as in those with no prior knowledge or strong feelings on a situation's outcome — can actually be vital to achieving a democratic consensus. These individuals tend to side with and embolden the numerical majority and dilute the influence of powerful minority factions who would otherwise dominate everyone else. This finding — based on group decision-making experiments on fish, as well as mathematical models and computer simulations — challenges the common notion that an outspoken minority can manipulate uncommitted voters and can ultimately provide insights into humans' political behavior. The research team was led by Iain Couzin, an assistant professor of ecology and evolutionary biology.

- In an effort to accelerate innovation in sustainable energy and environmental technology, a collaborative network known as the Princeton Energy and Environment Corporate Affiliates Program has been created at the University to engage a wide range of businesses. The program is being led by Princeton's Andlinger Center for Energy and the Environment in close partnership with the University's Woodrow Wilson School of Public and International Affairs, the Princeton Environmental Institute and the School of Architecture. PSEG, the parent company of the New Jersey-based utility PSE&G and other energy companies, has signed on as the program's first charter member.

PPPL to launch major upgrade of key fusion energy test facility

NSTX project will produce most powerful spherical torus in the world

JOHN GREENWALD

The U.S. Department of Energy's (DOE) Princeton Plasma Physics Laboratory (PPPL) is getting an earlier-than-expected start on a $94 million project as the next stage of its mission to chart an attractive course for the development of nuclear fusion as a clean, safe and abundant fuel for generating electricity.

The project will upgrade the major test facility at PPPL, the National Spherical Torus Experiment (NSTX), over the next 30 months, with completion slated for 2014. The work will enhance the position of the NSTX as the world's most powerful spherical torus — or tokamak — a device that controls the superheated and electrically charged gases called plasmas that create fusion power.

The overhaul "will be a huge boost to all NSTX science missions," said Stewart Prager, director of PPPL, which is managed by the University for the DOE Office of Science and has been a leader in fusion research for 60 years. Experiments done on the upgrade, he said, "will establish the physics basis to determine whether the NSTX design is suitable for a 'U.S. fusion nuclear science facility' — a possible next major research facility that would operate with fusion fuel."

Construction has been cleared by DOE officials to start immediately, six months ahead of schedule. Plans originally had called for the work to begin after the conclusion of a series of experiments on the NSTX tokamak. But when technical difficulties delayed the start of the experiments, PPPL managers decided to move directly to the upgrade rather than spend an undetermined amount of time addressing the technical issue. Specifically, a short that damaged a key piece of magnetic equipment would have been expensive and time-consuming to replace.

Work on the upgrade has brought excitement to the technicians and engineers at the laboratory. "We're building something that's one of a kind, that hasn't been built before," said Michael Williams, associate director for engineering and infrastructure at PPPL.

Fusion takes place when the atomic nuclei in plasmas combine at extremely high temperatures and release a burst of energy. Such reactions drive the sun and the stars. But sustaining fusion in the laboratory has proven quite difficult because plasmas that leak from the confinement can halt the reaction. Controlling the plasma is thus a basic goal of fusion research.

PPPL physicists will use the NSTX upgrade to assess the role of the compact reactor for the future development of fusion power. The spherical torus confines its plasma in the shape of a cored apple, unlike bulkier conventional tokamaks that produce doughnut-shaped plasmas and can be more costly to construct.

PPPL scientists are eager to explore mysteries that have puzzled them for years. A key issue is whether the NSTX reactor can maintain its record-high level of a measure called "beta" — the ratio of the pressure of a plasma to the strength of the magnetic field that confines it — as the plasma grows hotter. The higher the beta, the more cost-effective the confinement.

The NSTX upgrade will furnish new tools for probing such issues. The overhaul "will provide ample research opportunities for five to 10 years' worth of work at least," said Michael Zarnstorff, deputy PPPL director for research. "The whole NSTX group is quite excited by the opportunities and the leadership position that it will be in."

The makeover will boost the principal capabilities of the NSTX reactor, which began operating in 1999. The device puts high-voltage current into an isotope — or form — of hydrogen gas to make the intensely hot plasma that is confined inside the reactor's magnetic field. The upgrade will double the field strength to one tesla — or 20,000 times the strength of the Earth's magnetic field. The electric current flowing in the plasma will also double and reach 2 million amperes. By contrast, a 100-watt light bulb draws one ampere of current.

Achieving these increases calls for widening a stack at the center of the reactor that puts current in the plasma and helps to complete the magnetic field. Widening the center stack also will increase the electric pulse that drives the plasma current from one second to five seconds, giving researchers more time to study the plasma.

The enhancements will help double the temperature at the core of the plasma to at least 20 million degrees Celsius, or twice the approximately 10-million-degree Celsius core of the sun. New heating also will come from installation of a second device called a "neutral beam injector" to go with the one currently on the machine.

The increased power will enable PPPL scientists to tackle these major questions:

• Can the compact device continue to effectively contain plasma when

Continued on page 8

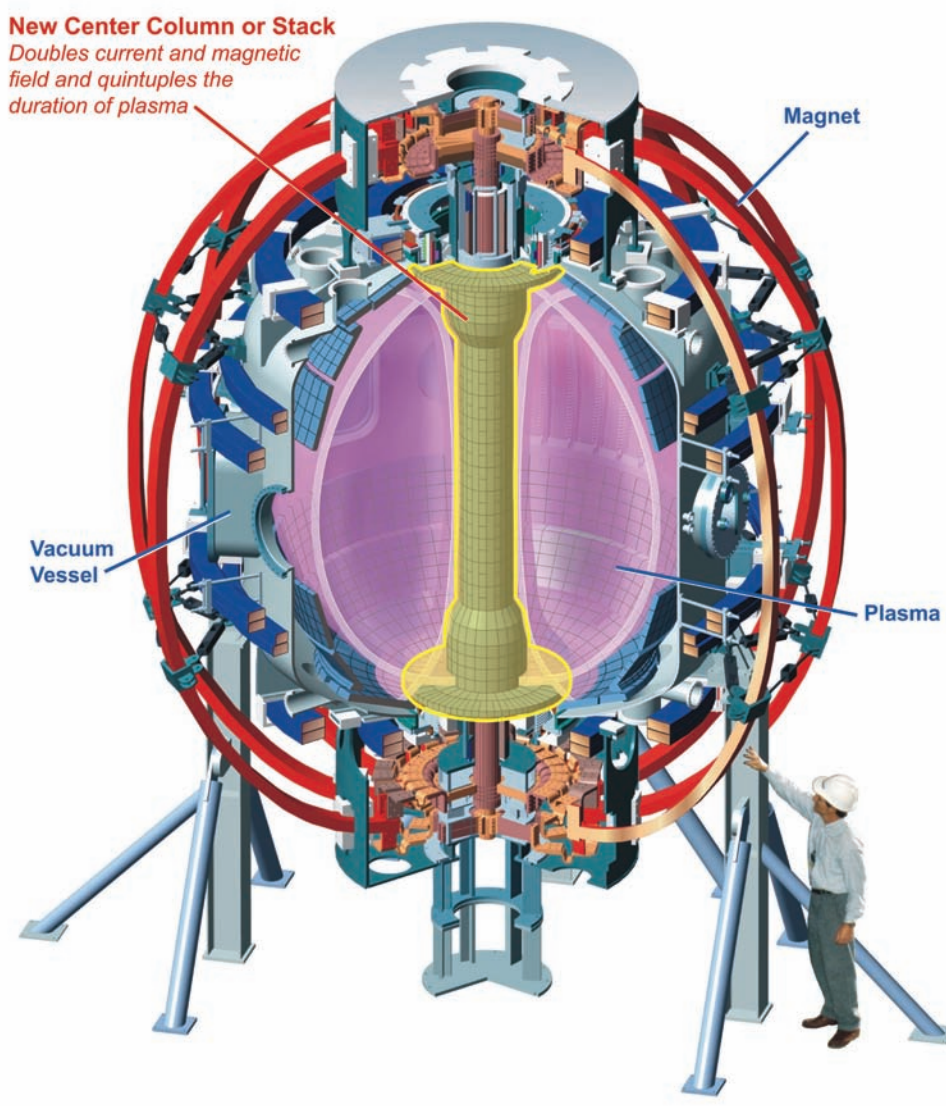


Image courtesy of the Princeton Plasma Physics Laboratory

The upgrade of the National Spherical Torus Experiment (NSTX) — the Princeton Plasma Physics Laboratory's major test facility — will provide a more powerful tool for the lab in pursuing the development of nuclear fusion as a clean, safe and abundant fuel for generating electricity. Work on the NSTX will take place over the next 30 months.

University to increase voluntary financial contribution to township, borough for 2012

Princeton University and Princeton Township have agreed that the University will increase its voluntary financial contribution to the township from $500,000 in 2011 to $525,000 in 2012 — a 5 percent increase — and that the University will contribute an additional $250,000 toward costs incurred by the township in connection with the transition to the consolidation of Princeton Township and Princeton Borough into a new Town of Princeton. The consolidation will be effective as of Jan. 1, 2013.

"We are pleased to be able to increase our base contribution to the township by 5 percent and to be able to make an additional contribution toward consolidation costs," said University Vice President and Secretary Robert Durkee. "We greatly appreciate the leadership the township has demonstrated in controlling costs while sustaining services, and we recognize the financial pressures it is facing, even as the University continues to cope with its own financial constraints. We are proud of our association with the township, and we look forward to similarly productive discussions with the new municipality when its leadership is in place in early 2013."

"Building on the work that we've done in achieving the first significant voluntary contribution from Princeton University in 2011, I'm pleased to announce that we have been able to build and significantly enhance our relationship with Princeton University for 2012," said Princeton Township Mayor Chad Goerner. "It's clear that the best way to make our community better for all of our residents is to have a collaborative relationship with Princeton University. I and my colleagues have recognized this and have continued to strive for a more professional and strategic dialogue that I hope will be a legacy heeded by the consolidated municipality in 2013."

Goerner stated that "the addition of a contribution earmarked for transition costs will go a long way in assuring a successful transition. It will certainly enable us to implement the consolidation commission's recommendations and put us in position to realize taxpayer savings as a result of consolidating the two municipalities. I thank my colleagues and Princeton University's leadership for making a strong commitment to not only uniting our community via a single government but for uniting our community in spirit by making this financial contribution."

The University's $500,000 contribution in 2011 was its first contribution of this kind to the township, although the University has long been the largest taxpayer in the township. More than $600,000 of its tax payment to the township for municipal purposes is associated with properties (primarily graduate student housing) that the University has elected to maintain on the tax rolls even though they qualify for exempt status under New Jersey law. The University's total 2011 property tax payment on potentially exempt township properties was $2.4 million, which includes payments to the school board and the county as well as to the township, and its total 2011 township tax bill, including non-exempt as well as potentially exempt properties, was $4.1 million.

Borough contribution

The University also has agreed to make a one-year voluntary contribution of $1.7 million to Princeton Borough in 2012, an increase of $500,000 over the 2011 contribution, with the understanding that $250,000 of the contribution will be used to offset expenses the borough incurs in connection with the consolidation of the borough with Princeton Township.

The University has also agreed to contribute $300,000 toward an expected expansion of the Princeton Firehouse on Witherspoon Street, if and when that expansion occurs. That contribution would likely be made to the consolidated Town of Princeton. The University also has agreed to continue to make an annual contribution of $20,000 to the Princeton Fire Department, a commitment that carries over from the six-year borough-University contribution agreement that expired on Dec. 31, 2011.

The University is the largest taxpayer in the borough, and its voluntary contribution is in addition to its annual tax payment. The University's tax bill on borough properties in 2011 was $3.5 million.

NASSAU notes Jan. 16-Feb. 12

UPcoming

Concert: Ensemble ACJW
8 p.m. Jan. 19
Richardson Auditorium, Alexander Hall

Lecture: "Visualizing the Atomic World"
Udo Schwartz, Yale University
9:30 a.m. Jan. 21
Auditorium, Princeton Plasma Physics Laboratory

Lecture: "Exploring the Warped and Violent Universe"
Nergis Mavalvala, Massachusetts Institute of Technology
9:30 a.m. Jan. 28
Auditorium, Princeton Plasma Physics Laboratory

Lecture: "Cooperation and Conflict in the Natural World"
Suzanne Alonzo, Yale University
9:30 a.m. Feb. 4
Auditorium, Princeton Plasma Physics Laboratory

Lecture: "The Latest Political Developments in Syria"
Richard Murphy, former U.S. ambassador
4:30 p.m. Feb. 7
Robertson Hall, Room 1

Clark Reading Series
Jonathan Franzen, novelist; James Richardson, poet and Princeton professor; and Nina Bahadur, Princeton senior
4:30 p.m. Feb. 8
Berlind Theatre

Lecture: "Prophet Muhammad: A Celebration of His Life and Legacy"
Seyyed Nasr, George Washington University
7:30 p.m. Feb. 10
Rockefeller College, Common Room

University's MLK Day ceremony to celebrate King's legacy

Princeton will commemorate the legacy of Martin Luther King Jr. with its annual King Day celebration Monday, Jan. 16, in Richardson Auditorium of Alexander Hall. Doors open at 1 p.m. The keynote address will be delivered by civil rights leader and educator Bob Moses, a visiting fellow in Princeton's Center for African American Studies.

The event, which is free and open to the public, will begin at 1:15 p.m. with musical selections from A New Perspective Jazz Band, a youth quintet from Ewing, N.J.


Moses

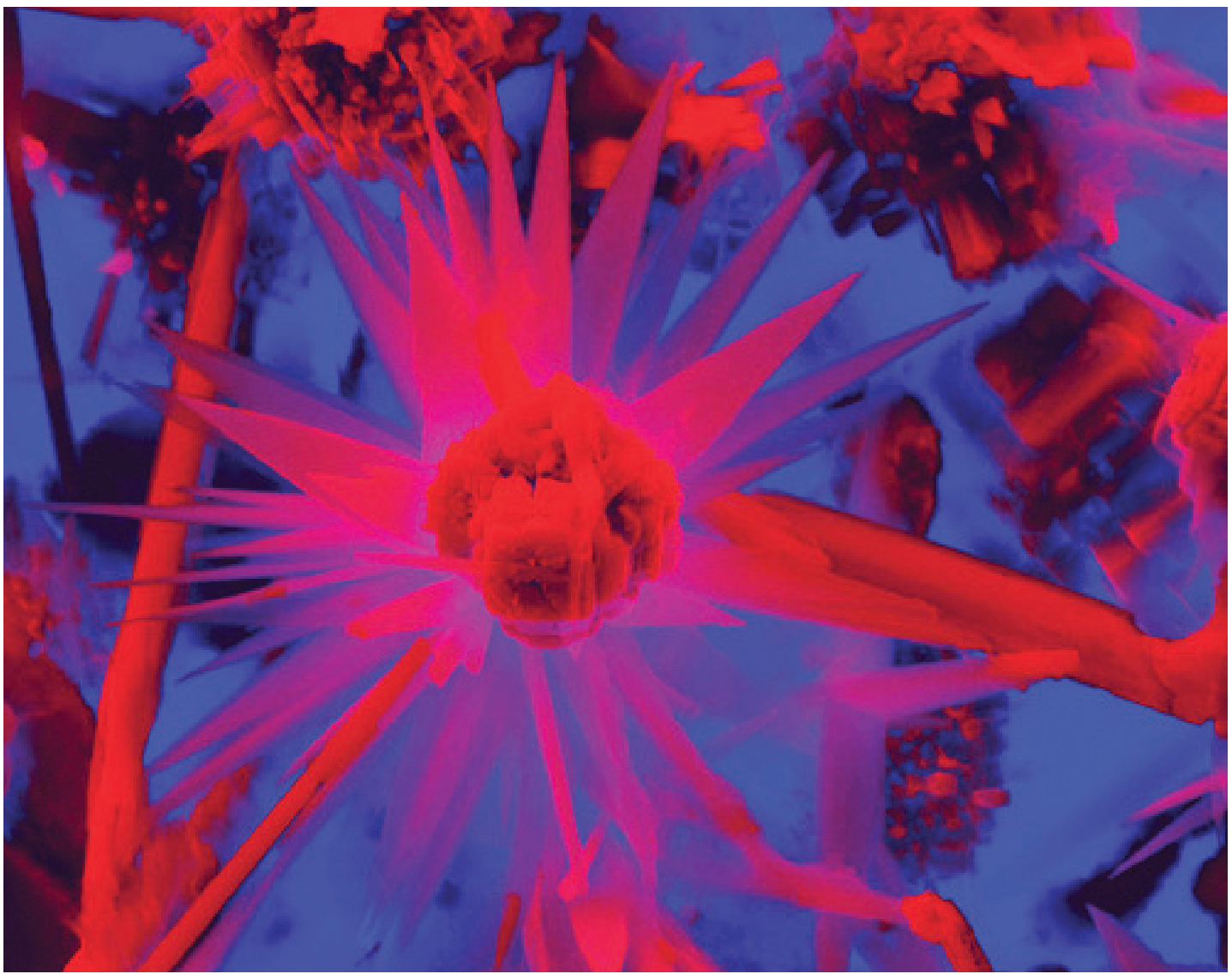
The ceremony will include the presentation of awards to student winners in grades 4 through 12 from area schools who entered an annual Martin Luther King Day-themed contest in literary arts, visual arts and video categories. Marking the 55th anniversary of the landmark desegregation of Central High School in Little Rock, Ark., by youngsters known as the Little Rock Nine, this year's King Day contests focus on the importance of education as a foundation for success. Students were asked to propose viable options for addressing disparity in educational access and encouraging academic excellence.

During the program, the University also will present the MLK Day Journey Award, which recognizes a member of the Princeton faculty, staff or student body who best represents King's continued journey.

Moses, the keynote speaker, is the 2011-12 distinguished visiting fellow in Princeton's Center for African American Studies. Moses was a leader in the 1960s civil rights movement, serving as a key figure in the Mississippi Summer Project of 1964 to register black voters and protest racial discrimination. He is the founder and president of the Algebra Project, a national nonprofit organization that has helped thousands of students in urban and rural school districts develop essential mathematical skills.

Moses, who was awarded an honorary doctoral degree by Princeton in 2004, will co-teach a course this spring focusing on education and labor policies through the lens of race. He is the co-author of "Radical Equations: Math Literacy and Civil Rights" (2001) and co-editor of "Quality Education as a Constitutional Right: Creating a Grassroots Movement to Transform Public Schools" (2010).

The King Day event will be webcast live at www.princeton.edu/webmedia. It is convened and coordinated by the institutional equity and diversity team in the offices of the provost and human resources.



An exhibition of digital works submitted in Princeton's fifth "Art of Science" competition are on view until November in the Friend Center. The exhibition features images made by University community members during the course of scientific research. This image by Nan Yao, Gerald Poirier and Shiyou Xu of the Princeton Institute for the Science and Technology of Materials' Imaging and Analysis Center shows crystal structures formed during an experiment on piezoelectric nanostructures related to research on clean alternative energy sources.

CALENDARlinks

For broader listings of campus public events:

PUBLIC EVENTS CALENDAR
www.princeton.edu/events

Information on tickets is available at the website below:

UNIVERSITY TICKETING
www.princeton.edu/utickets
609-258-9220

For listings by selected University sponsors:

Art Museum
www.princetonartmuseum.org
609-258-3788

Athletics
www.goprincetontigers.com
609-258-3568

Center for African American Studies
www.princeton.edu/africanamericanstudies/events
609-258-4270

Council of the Humanities
humanities.princeton.edu/calendar
609-258-4717

Frist Campus Center
www.princeton.edu/frist
609-258-1766

Lewis Center for the Arts
www.princeton.edu/arts/events/calendar
609-258-1500

Library
www.princeton.edu/~rbsc/exhibitions
609-258-3181

McCarter Theatre
www.mccarter.org
609-258-2787

Music Department
www.princeton.edu/music
609-258-4241

Office of Information Technology
www.princeton.edu/academicservices/
609-258-2949

Public Lecture Series
lectures.princeton.edu

President's Lecture Series
www.princeton.edu/president/presidents_lecture_series
609-258-6100

Princeton Institute for International and Regional Studies
www.princeton.edu/piirs/news-events/events
609-258-4851

Princeton University Concerts
www.princeton.edu/puconcerts
609-258-2800

Richardson Auditorium
www.princeton.edu/richaud
609-258-5000

School of Architecture
soa.princeton.edu
609-258-3741

School of Engineering and Applied Science
www.princeton.edu/engineering/events
609-258-4554

Woodrow Wilson School of Public and International Affairs
wws.princeton.edu/events
609-258-2943

For additional events sponsored by specific departments, programs and offices:

University "A to Z" search page
www.princeton.edu/main/tools/az

For audience members needing assistance:

Office of Disability Services
www.princeton.edu/ods
609-258-8840

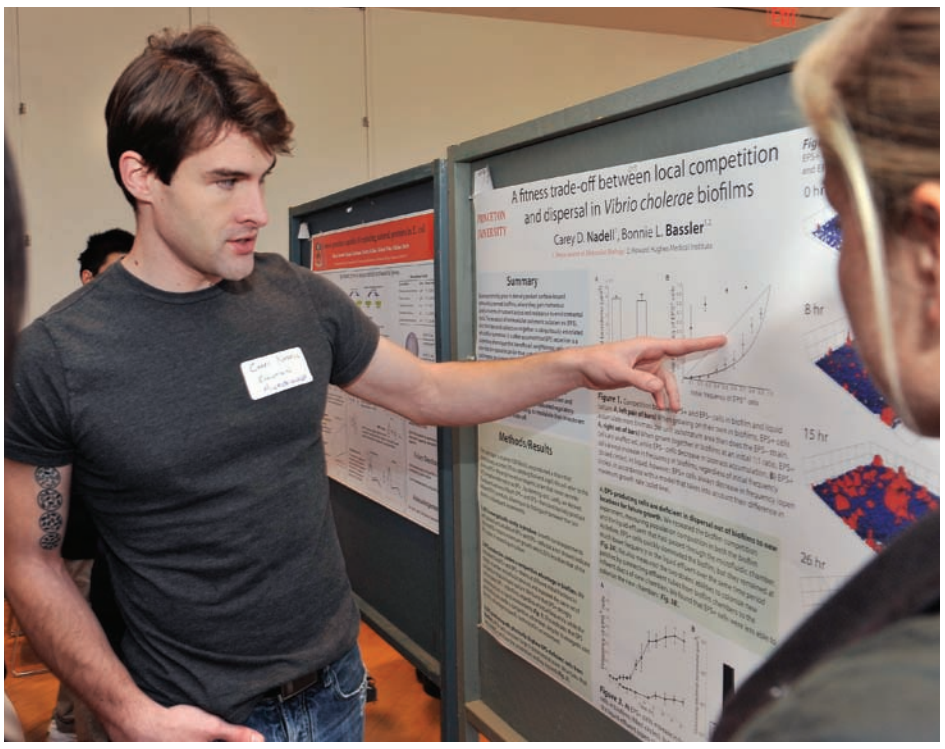
To offer submissions for "Nassau notes," use the online form:
www.princeton.edu/main/news/share/submitevents

Symposium highlights work of early-career researchers

Catherine Zandonella

As interdisciplinary collaborations among Princeton scholars continue to grow, it still can be unusual to hear an art historian describing Italian villas to a molecular biologist, or see a mechanical engineer snap a "slap bracelet" on his wrist to explain his research to a psychologist.

These sorts of interactions are quite normal at the Princeton Research Symposium, however. The annual event offers graduate students and postdoctoral researchers at the University the opportunity to present their work to a broad audience of fellow students, faculty members, alumni and community members.



Carey Nadell, a postdoctoral fellow in the Department of Molecular Biology, presents a poster detailing his research on the social lives of bacteria.

The multidisciplinary symposium, which started in 2006, is organized by graduate students and is supported by the Graduate School and other University co-sponsors. "We recognized the need for our graduate students and postdoctoral researchers to have a forum where they can present their work and demonstrate the tremendous creativity that characterizes our University community," said William Russel, dean of the Graduate School.

The symposium is an important forum for early-career researchers, as mastering the ability to talk about research across disciplines has never been more important, said David Redman, associate dean of the Graduate School. "Support for science and humanities research depends on the public knowing why they should care about research," he said.

The event is a terrific opportunity for researchers to sharpen their presentation skills, added Victor Oyeyemi, a fourth-year graduate student in the Department of Chemical and Biological Engineering and one of the organizers of the event. "University students and researchers usually go to conferences that are specific to their field where the language is highly technical," he said. "At this symposium, you communicate with people who don't speak that language."

Showcasing a wealth of projects

The most recent symposium, held Dec. 3 in the Friend Center, featured 16 presentations and 14 research posters covering a variety of topics, including the exploration of the secrets of a 450-year-old Italian villa; models of how bacteria grow into slimy coatings called biofilms; an examination of how people of different races communicate; and a study aimed at unraveling what the Venus flytrap has in common with a slap bracelet.

A graduate student in the Department of Art and Archaeology, Johanna Heinrichs is fascinated by a Renaissance-era villa built by a Venetian nobleman. The stately building, located 50 miles southwest of Venice outside the town of Montagnana, was thought to be simply a headquarters for the nobleman's agricultural enterprise, but Heinrichs' research indicates the villa was actually his primary residence. Her findings contradict the prevailing view that wealthy Venetians considered Venice to be their center of social and cultural activities and spent little time in the surrounding countryside.

Presenting her work to an audience unacquainted with the details of Venetian life presented some challenges, but was very rewarding, said Heinrichs, whose adviser is John Pinto, the Howard Crosby Butler Memorial Professor of the History of Architecture. "The audience asked different sorts of questions from the ones asked by people in my field," Heinrichs said. "They made me think about issues that I hadn't thought about."

Heinrichs' presentation on the social lives of Venetian nobility was preceded by a talk on the social lives of bacteria. People may not think of bacteria as social creatures, said Carey Nadell, a postdoctoral fellow in the Department of Molecular Biology, but in fact they are highly gregarious, forming densely populated communities that researchers call "biofilms." People who have skipped a day of brushing their teeth have had experience with biofilms, which form plaque on and between teeth.

Nadell is studying how individual bacterial cells grow into biofilms. His research, conducted with Bonnie Bassler, the Squibb Professor in Molecular Biology, suggests that bacteria secrete a glue-like substance that helps them bind to and benefit their close kin, but not unrelated bacteria. As a result, cells that secrete extracellular glue gain a competitive advantage by forming biofilms, although they give up the ability to easily disperse to new environments. The work was published in the Proceedings of the National Academy of Sciences in August.

"I think it is critical for scientists to be able to communicate to people inside and outside their fields of expertise," said Nadell. He added another reason for participating in the symposium: "It is also just fun."

Just as bacteria have to get along, so do people. Deborah Son Holoien, a fourth-year graduate student in the Department of Psychology, studies how people deal with interracial interactions through two primary mechanisms: trying to be colorblind and ignore race altogether, or embracing multiculturalism by highlighting racial differences.

Working with her adviser Nicole Shelton, a professor of psychology, Holoien conducted a study to explore which strategy is more effective in improving interracial interactions. Their work, which will appear in the Journal of Experimental Social Psychology, suggests that multiculturalism performs better at decreasing interracial difficulties than colorblindness, which can backfire and result in whites displaying more prejudice in certain situations.

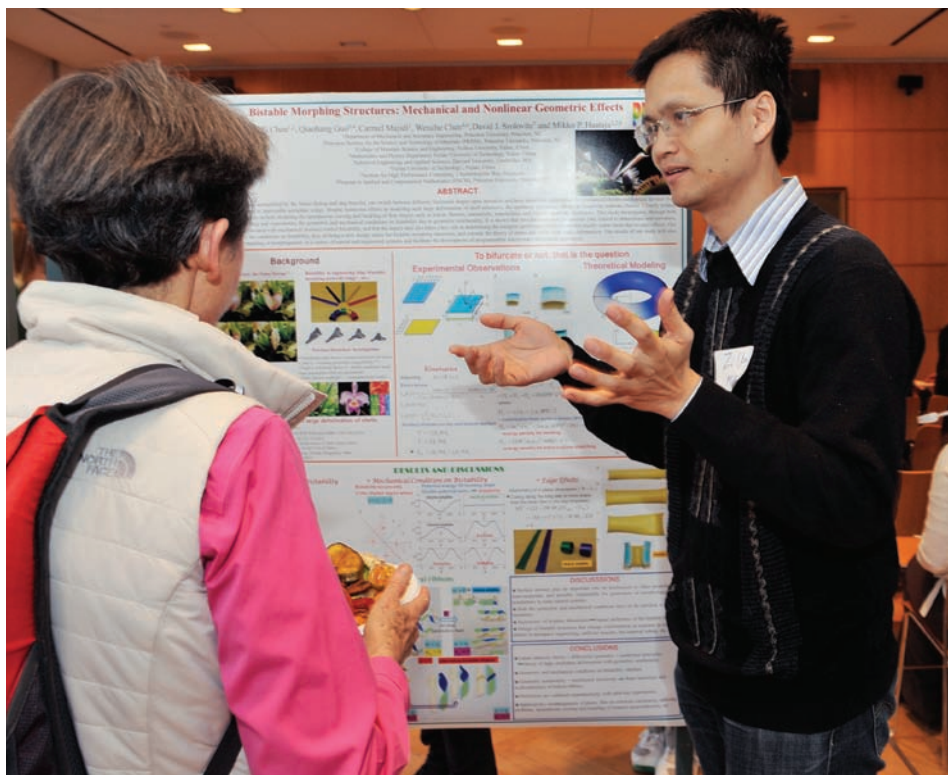
Holoien said she heard about the symposium from a staff member in her department. "I decided to participate because I am excited to share my research," she said.

Photos by Mark Czajkowski

Deborah Son Holoien, a graduate student in the Department of Psychology, was one of the participants in the Dec. 3 symposium, explaining her research on how people deal with interracial interactions.

Excitement alone is not always sufficient for explaining difficult concepts, however. Sometimes a prop is needed. For Zi Chen, that prop is a slap bracelet, a toy wristband that snaps from a straight position into a curled position around the wrist. Chen, who finished his Ph.D. in December in mechanical and aerospace engineering, used the slap bracelet to illustrate his talk on how structures can switch rapidly between different shapes.

Johanna Heinrichs, a graduate student in the Department of Art and Archaeology whose work focuses on Venetian life during the Renaissance, visits the symposium poster session.



Zi Chen, who recently earned his Ph.D. in mechanical and aerospace engineering, describes his research on factors that cause structures to snap from one configuration to another.

Researchers would like to apply these principles to constructing devices such as flexible robots, artificial muscles and deployable airplane wings. Chen is exploring the factors that cause structures to snap from one configuration to another in collaboration with his advisers: Mikko Haataja, an associate professor of mechanical and aerospace engineering; David Srolovitz, a former Princeton faculty member and now executive director of the Institute of High Performance Computing in Singapore; and colleague Qiaohang Guo at Fujian University of Technology in China.

"It turns out that nature has been experimenting with these multistable structures for millions of years," said Chen, whose work on a related topic was published last year in Applied Physics Letters. "For example, the Venus flytrap, one of the fastest moving plants, can be triggered to transition from an open state to a

Continued on page 8

Concussion

Continued from page 1

athletic medicine and head team physician for University Health Services, have employed advanced imaging techniques at the neuroscience institute to aid in their research.

The two are in the midst of a study following concussed student-athletes for two months after injury. The work centers on the use of new techniques to study brain injury — functional magnetic resonance imaging (fMRI) and diffusion tensor imaging (DTI) scans. The study investigates how findings from these techniques compare and possibly correlate to findings on clinical measures of symptoms, the results of neurologic exams that include cognitive evaluation and balance, and the outcomes of formal neuropsychological testing.

"We hope to further understand how the brain recovers from what is a common, though often underreported, injury in athletics," said Dettwiler. The Centers for Disease Control and Prevention (CDC) estimates that 1.6 million to 3.8 million sports concussions may occur annually.

The research could aid the development of more sophisticated ways to evaluate and manage concussions.

"The implications of Margot and Annegret's collaboration could be significant. Sports-related concussions have been considered a transient problem in neurological function brought on by a trauma — that is, it's been thought to be a problem of brain function, not necessarily brain structure," University Health Services Director John Kolligian said. "Using brain-imaging techniques, their initial research suggests that concussive injuries also involve structural changes in the brain."

Their work comes at a time when the national media have cast a spotlight on the short- and long-term ramifications of concussions, as well as the Ivy League's recent adoption of stringent measures for football. According to Putukian, these include limiting the number of days of full-contact practices, enforcing rules related to illegal hits, and increasing the education of athletes and coaches about the condition.

"The imaging study that Margot Putukian and Annegret Dettwiler are doing is fundamentally important because it may be a way to objectively diagnose a concussion," said Stanley Herring, a clinical professor at University of Washington Medicine, who also is team physician for the Seattle Seahawks football team and member of the NFL Head, Neck and Spine Committee. "Right now we think we know what a concussion is, but their work could tremendously advance our ability to study and understand this injury."

Bridging academic, sports research interests

While there has been growing public attention on how concussions affect physical and mental health following recent studies, such as early-phase research on Alzheimer's disease and other conditions in professional football players with repeated head injuries, Dettwiler and Putukian separately studied brain trauma for many years before each arrived at Princeton in 2004.

Putukian, who received her medical degree from Boston University School of Medicine, has been involved in national and international concussion management efforts, including serving as a consultant for the NCAA and the CDC. She also is currently on the NFL Head, Neck and Spine Committee. Dettwiler, who received her Ph.D. from Columbia University, worked with traumatic brain injury patients at the nonprofit organization Bancroft NeuroHealth.

The pair began collaborating in 2008, and their current work using fMRI and DTI scans surpasses the abilities of traditional medical imaging techniques such as computed tomography (CT) or magnetic resonance imaging (MRI) scans, which can show more serious brain injury such as skull fracture or intracranial bleeding, but are not sensitive enough to detect subtle changes in the brain due to concussion, Dettwiler explained.

"Concussions can be challenging because unlike other injuries, there is no one, definitive test or marker that easily sorts out whether or not someone has an injury, or how severe it is," Putukian said. "You can't 'see' them the way you would a broken bone — rather you combine several components such as symptoms and clinical and cognitive evaluations to make a diagnosis."

"One of our research questions is do we pick up something from these imaging techniques that we're not able to observe through the usual clinical evaluations used today?" she continued.

For the study, Dettwiler's team performs the neuroimaging component, including the acquisition image analysis and interpretation of DTI scans of concussed subjects to track changes in brain structure, as well as fMRI scans to examine whether their brains function differently while performing simple and complex tasks.

This research, in which Princeton's student-athletes participate voluntarily, is done in conjunction with a comprehensive concussion program in which varsity athletes already are involved, which includes preseason as well as post-injury assessments.

The preseason exam includes a standardized neurological screening known as a sideline concussion assessment. The screening incorporates evaluating symptoms and giving cognitive and balance tests, along with computerized and sometimes paper-and-pencil neuropsychological testing. Administered by the athletic training and medical staff, neuropsychological tests measure brain behavior relationships and include tests evaluating verbal and visuospatial memory, immediate and delayed memory function, attention span, reaction time, tracking abilities, and processing speed.

The staff also obtains information regarding modifying factors that may prolong recovery — such as prior concussion, headache disorders, attention deficit hyperactivity disorder (ADHD) and learning disabilities, depression and anxiety — as part of the confidential preseason exam. In addition, athletes learn about the importance of reporting injuries, including those that may be indicative of concussion.

When an athlete participating in the research sustains a concussion, they are evaluated by the athletic medicine staff using the sideline assessment tool. Subsequently, athletes perform the more comprehensive battery of neuropsychological testing, with both computer and paper-and-pencil testing. Administered by the athletic training staff, the findings are then interpreted by an outside consulting neuropsychologist, who compares them to the athlete's baseline information. This interpretation, along with the athlete's clinical information and modifying factors, are used by the team physician to make individualized management and return-to-play decisions.

Detecting structural differences in the brain

While their work is ongoing, the researchers hypothesize the DTI, fMRI and other evolving MRI techniques may demonstrate structural differences in injured athletes' brains, which may correlate with deficits in cognitive function found via the subjective, clinical and neuropsychological tests currently used to diagnose concussions. They also are tracking brief measures of depression and anxiety before and after concussion.

Their current research builds on their pilot study published in the Journal of Neurotrauma in February 2011 with former Princeton neuroscience postdoctoral fellow Valerie Cubon and Cynthia Boyer of Bancroft NeuroHealth. In that study, DTI scans were performed on 10 concussed student-athletes with prolonged symptoms such as headaches, dizziness and trouble concentrating, which they experienced for at least six weeks to more than a year. The scans provided evidence of structural differences in the brain, suggesting that DTI may be a useful tool to evaluate concussive injury.

Photo by Brian Wilson

Annegret Dettwiler-Danspeckgruber (right), an associate research scholar at the Princeton Neuroscience Institute, and postdoctoral researcher Murali Murugavel (left) prepare a participant for diffusion tensor imaging and fMRI scans.

While other studies have used DTI scans to capture structural changes following more severe trauma, Dettwiler said their current work aims to push the technology further, exploring if scans are sensitive enough for patients with mild concussions.

"It's currently not feasible to widely use DTI and fMRI scans outside of a research setting," Dettwiler said, noting that the imaging "can only be used in a group comparison and is not yet developed to assess structural changes in individual brains."

Putukian added, "We do not know what the differences mean clinically, or how they correlate to clinical findings, if at all." She said that while the DTI and fMRI scans are not yet ready for clinical use, she and Dettwiler are "hoping our work can help spur the development of technological tools that one day can be used in the clinical environment."

While acknowledging their research "is just one piece of the puzzle," Putukian said the two are hopeful they can elucidate some important questions.

"We're very interested to see if there tends to be a correlation between the severity of injury and what we observe through these advanced brain-imaging techniques," Putukian said. "Are the scans of an athlete who takes months to recover different from the athlete who appears to be better in five days?"

Even if they do not discover such a correlation, Dettwiler said, they may find that DTI and fMRI scans observe that changes persist in the brain even when an athlete appears to be symptom-free following traditional medical tests and/or neuropsychological tests. This could influence the decision to learn when it's truly safe for players to get back in the game — a decision that is important in order to minimize risk for repeated injuries.

"If a DTI scan were to show that the brain is still injured a month after a concussion, that could lead to a major change in how concussions are treated," said Lester Mayers, director of sports medicine at Pace University, who has advocated for a longer time interval allowed for concussed athletes before return to play.

Helping future student-athletes

According to Kolligian, in linking the University's neuroscience institute and University Health Services, Dettwiler and Putukian's partnership is a "bold example" of how research faculty and student-life professionals can leverage their distinctive perspectives to help students.

The clinical focus of their work is noteworthy given that Princeton does not have a medical school, Dettwiler and Putukian said. Daniel Osherson, a professor of psychology affiliated with the institute, said their study "unites clinical and basic science perspectives."

"Concussion is a potentially serious medical condition; at the same time, it offers a window on fundamental aspects of brain structure and function," said Osherson, the Henry R. Luce Professor of Information Technology, Consciousness and Culture at Princeton.

Osherson is a research collaborator on Dettwiler and Putukian's current study, along with neuroscience postdoctoral fellow Murali Murugavel; assistant athletic trainer John Furtado; neuropsychologist Andrew Conway, a senior lecturer in Princeton's psychology department; neuropsychologist Ruben Echemendia; and Cubon, who is now an assistant professor of chemistry at Kent State University-Trumbull. Putukian added that Princeton's athletic trainers also are involved in the concussion program.

While their goals are long-term, the researchers said that simply engaging students to participate in research helps reinforce growing awareness about the seriousness of concussions and the importance of early intervention.

"It used to be 20 years ago a coach may have told an athlete with a minor head injury to 'shake it off.' That does not happen anymore," Putukian noted.

Senior Kelly Pierce, a member of the women's openweight crew team who served as a control subject for the study, said she would encourage her peers to report "even the smallest head trauma." "Athletes should be more aware of concussions so they can receive proper treatment and stand a better chance of recovery, especially from more concussions that might occur in the future," Pierce said.

Men's lacrosse player Brian Reilly, who sustained a minor concussion during a practice, said he was inspired to participate in the study because he has a brother involved in athletics who recovered from concussions.

"Questions about concussions and their effects on athletes are all over the media today. The answers, however, are not," said Reilly, a sophomore. "Hopefully Dr. Putukian and Dr. Dettwiler's research will yield a more specific and practical treatment than what is currently available to concussed athletes, and will spare somebody some of the challenges that faced my brother."

‘Gently used’ business attire needed for annual clothing drive

The University is conducting its annual clothing drive Jan. 25 through Feb. 1 to benefit HomeFront’s Suitably Dressed, the Mercer County Community College Career Training Institute and Operation Fatherhood of Trenton, organizations that collect “gently used” business attire for men and women.

The clothing goes to individuals who are entering or re-entering the workforce, and all types of business and business-casual clothing in good condition are needed. These include suits, dress slacks, khakis, dress shirts, collared casual shirts, blazers, skirts, sweaters, dresses, jackets, coats, ties, shoes, belts, jewelry, handbags and other accessories. Eyeglasses also will be collected for donations to Lions Club International.

Items can be brought to 126 Alexander St. (side entrance) weekdays between 8 and 9 a.m., and 12:30 and 1:30 p.m.

Volunteers are needed during collection hours. For more information or to volunteer, contact Erin Metro in the Office of Community and Regional Affairs at emetro@princeton.edu or 609-258-5144.

The drive is coordinated by the Office of Community and Regional Affairs, the Department of Building Services and the Office of the Provost.

Museum

Continued from page 1

answer fundamental questions about works of art.

“There’s been a concept based on what (art historian) Michael Baxandall called ‘the period eye’ — a sense that through looking at a broad array of what’s called ‘cultural artifacts,’ we can get a better understanding of the impulses of a culture at any given point in the past, and therefore pull objects out of a vacuum and put them in a broader context,” he said. “That is something that has been at large in the broad fields of the humanities for a good while now, but not something that we’ve particularly explored relative to our installation practice in the museum galleries until very recently.”

The approach provides opportunities to incorporate much more interpretive information in the galleries, such as more complete labels addressing “the question of why an individual work of art matters — why someone who isn’t a specialist in the discipline ought to find something engaging,” according to Steward.

In one gallery, the 1888 painting “Tarascon Diligence” (Tarascon Stage Coach) by Dutch artist Vincent van Gogh is displayed near two 1856-57 Japanese woodblock prints from the series “100 Views of Edo” by Ando Hiroshige. A nearby label explains that many avant-garde artists of the late 19th century abandoned traditional European painting practices and looked to non-Western art forms, such as Japanese prints, for innovative approaches to composition and color.

Photo by Bruce M. White

Non-Western art forms, such as Ando Hiroshige’s Japanese woodblock print “100 Views of Edo” (left), were used by many avant-garde artists of the late 19th century, including Vincent van Gogh, for innovative approaches to composition and color. Van Gogh’s oil painting “Tarascon Diligence” (Tarascon Stage Coach) is shown on the right.

Christopher Heuer, an assistant professor of art and archaeology at Princeton, said that the new approach is going beyond making the museum more accessible to patrons.

“(It) will do what museums across the country, across the world are being forced to do now, which is make art relevant to the present day in a way that’s more than kind of superficial,” Heuer said. “That’s always been something we try to talk to students about, but James has also been crucial in opening up the museum to more than just the University community. These kinds of comparisons he’s drawn are just one way to do that.”

Steward said he wants the museum to serve students of art and of other disciplines, and members of the University community and the wider community. He has implemented several initiatives designed to make the museum more approachable, including keeping the galleries open Thursdays until 10 p.m. and programming those evenings with other activities connected with the visual arts, such as film screenings, gallery talks and concerts.

“I think increasingly our mission is to serve simultaneously as a very deep and rich ‘laboratory’ for teaching and research that goes back to 1882 when we were co-founded with the Department of Art and Archaeology, but recognizing that we can’t any longer simply be a ‘laboratory’ for that finite sub-part of the University community,” Steward said. “Instead, we have to engage every Princeton student. My view is that once we’re embarked on that goal of trying to find ways, whether they’re in the classroom, outside the classroom or on a purely social level, we’re developing strategies that are just as likely to be effective in finding ways to engage members of the non-University public.”

The museum recently received a $500,000 grant from the Andrew W. Mellon Foundation of New York to support an expansion of this effort, called “Activating the Collections.” The award will fund, in part, the establishment of a new position, a curatorial fellow for collections engagement, who will work with curators, faculty, students, guest scholars, artists and other experts across disciplines to develop and present compelling interpretative approaches and materials.

The grant also will establish the Museum Voices Colloquium, which will function as a visual arts think tank in bringing together traditional and nontraditional experts to consider new ways of understanding art.

ONLINE: “Approaching Art” video
www.youtube.com/princeton

NSTX

Continued from page 4

the temperature rises, which could make the confinement more difficult? Greater heat will reduce the rate at which plasma particles collide with one another — a phenomenon called “collisionality” that could further hinder the confinement. If the upgrade can effectively control the hotter plasma, “that means we could achieve high fusion power in a pretty compact machine, and that could make machines cheaper in the future,” said Jonathan Menard, a principal research physicist and program director for the NSTX.

• Can the researchers find new ways to start and sustain the electric current that creates the plasma? New methods are essential because future reactors will operate under conditions that would damage the spherical tokamak reactor’s solenoid — a coil that winds around the center stack and delivers the current. PPPL scientists have been testing alternatives. Eliminating the solenoid “is extremely important,” said Masayuki Ono, a principal research physicist who heads the NSTX department at PPPL. “If we can demonstrate that, we will have a very solid basis to design the next-step machine.”

• Can the upgrade tame the hot plasma particles that escape the confinement and reach the reactor walls? This “power flux” can damage interior surfaces, drive impurities back into the plasma and shut down the reaction. Researchers have coated parts of the present NSTX with lithium, a metal that turns liquid when struck by stray particles and sponges up the impurities. But “the power flux that we expect in the upgrade will be very high compared to what we handle today,” Ono said. “That is something we need to find attractive solutions for.”

How PPPL scientists handle the increased flux could serve as a model for ITER, a major conventional test reactor that a consortium of countries including the United States is building in the south of France. ITER aims to produce a sustained fusion reaction — or “burning plasma” — by the late 2020s that will put out more energy than is needed to create it — a basic requirement for future commercial reactors.

The NSTX upgrade could also serve as the gateway to a next-generation spherical torus that would produce a burning plasma to complement the output of ITER. Such a spherical torus would be roughly twice as powerful as the NSTX upgrade, said deputy PPPL director Zarnstorff, and would be used to test components for a commercial fusion reactor. Fusion energy experts expect a commercial reactor to be in operation by 2050.

Symposium

Continued from page 6

closed state in the blink of an eye to capture insects.”

During the symposium’s poster session, Chen and the presenters mixed with fellow researchers, alumni and community members, including a group of high school students from the Peddie School in Hightstown, N.J. “From our point of view this is a great thing that Princeton does because our students have the opportunity to meet graduate students and learn what makes a good poster,” said Shani Peretz, chair of the science department at the school.

The event, which drew an audience of about 100 people, was supported by the Graduate School, the School of Engineering and Applied Science, the Office of Graduate Alumni Relations, the McGraw Center for Teaching and Learning, the Graduate Student Government and the Department of Molecular Biology.

The day was capped by a keynote presentation by Anthony Grafton, the Henry Putnam University Professor of History, who commented on the energy that the researchers brought to their presentations. “What you have here,” he said, “is smart, creative people talking about their favorite subject — their research.”

The next Princeton Research Symposium will take place Nov. 17. Attendance is free and open to all. More information, including pictures and videos from previous events, is available on the symposium website at www.princeton.edu/~prs.