Nine Princetonians receive Rhodes, Marshall awards

Paul Karr

Nine Princetonians — including six seniors and three recent alumni — have been awarded the prestigious Rhodes and Marshall scholarships.

Seniors Elizabeth Butterworth, Miriam Rosenbaum and Astrid Stuth, along with Class of 2011 graduate Mohit Agrawal, have been awarded Rhodes Scholarships for graduate study at the University of Oxford. They are among the 32 American recipients of the fellowships, which fund two to three years of graduate study at Oxford. Princeton’s four winners, three of whom are women, represent the most at the University in any one year since 1990.

In addition, seniors Christine Chang, Kyle Edwards and Emily Rutherford, along with Samuel Dorson of the Class of 2011 and Alice Easton of the Class of 2009, are five of 36 American college students who have been awarded 2012 Marshall Scholarships. The award covers the cost of graduate study and living at a British university, the department’s choice for two to three years.

Deirdre Moloney, director of fellowship advising for the University’s Office of International Programs, said there was an increase in female applicants and successful recipients of the fellowships this year, noting the positive influence of faculty advisers, endorsement committee members and the Steering Committee on Undergraduate Women’s Leadership, which in March issued a comprehensive report on increasing leadership among Princeton women.

“Faculty and other campus mentors, including those writing letters in support of applications, were aware of this lack of [female] representation and encouraged many outstanding women to apply,” Moloney said.

Rhodes Scholars

Agrawal, a West Lafayette, Ind., native who majored in mathematics, plans to pursue a Ph.D. in financial economics at Oxford. A recipient of the George J. Mitchell Scholarship in 2011, he currently is enrolled in a master’s program in economic policy evaluation at the National University of Ireland in Galway. His interest in economics and politics blossomed at Princeton, where he engaged in a range of interdisciplinary work both in and out of the classroom.

“I am a mathematician, and from classwork at Princeton I’ve learned how mathematics drives applications in economics, biology and computer science,” Agrawal wrote in his Rhodes application. Discussing his future plans, Agrawal said he would “seek to combine my background in politics and mathematics to help craft economic policy. Implementing economic policy at the World Bank, the Treasury Department or in Congress … requires that I first pursue graduate specialization in the field.”

Butterworth, of Auban, Mass., is a classics major who plans for a master’s degree in comparative and international education at Oxford, with a further goal of studying evidence-based social intervention.

Butterworth, who has long had a passion for the arts and education, noted in her application for the Rhodes that she ultimately hopes to return to the United States “to prepare to promote arts education as a route to civic awareness and engagement in learning.”

In the future, she said that she could imagine “running a city school system and translating my research into policy implementation.”

Rosenbaum, who is from the Bronx, N.Y., and is currently pursuing a major in the Woodrow Wilson School of Public and International Affairs, plans to obtain a master’s degree in public health at Oxford.

Rosenbaum, whose studies have extended to pursuing certificates in African American studies, Near Eastern studies and Judaic studies, will use the Rhodes Scholarship to study bioethics.

“My passion lies in healthcare, and I plan to be an advocate for marginalized populations,” she wrote in her Rhodes application.

Stuth, of Hubertus, Wis., is an East Asian studies major with a focus on the arts. She will pursue a master’s degree in international relations at Oxford. Her independent work at Princeton has examined China’s national identity, and the ways in which that identity has been shaped by various outsiders’ views of the nation and its single-party system. At Oxford, she will continue to focus on China’s transformation and rise.

Through studies in Hong Kong and Beijing, Stuth said she gained a close appreciation for some of the misunderstandings and misperceptions between China and the United States.

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New high-performance computing center builds research capacity

Catherine Zandonella

After several years of planning and more than a year of construction, Princeton’s High-Performance Computing Research Center opened its doors in late November — giving researchers on campus new capacity to tackle some of the world’s most complex scientific challenges.

Situated on Princeton’s Forrestal campus, the 47,000-square-foot building is the new home to powerful research computers that are capable of generating models of galaxy formation, tracking the motion of a single molecule and simulating the seismic forces of an earthquake, among other highly technical tasks.

The facility, which will come fully online when all systems are operational in January, is the centerpiece of Princeton’s plan to provide robust computing resources to all faculty members and researchers. Since Jan. 1 alone, the University’s existing high-performance computers located at sites across campus — and which now will be united at the new center — have provided resources for 214 unique researchers from 57 faculty research groups and two undergraduate classes spread among 15 academic departments.

“Princeton’s approach is really unique in that it is making those powerful computing resources available to all researchers,” said Jerome Thomp, the Blair Professor of Geology and the director of the Princeton Institute for Computational Science and Engineering (PICSciE), which will oversee the new facility in conjunction with the Office of Information Technology (OIT). “At most universities, researchers work department-by-department or individually to get the computing resources they need.”

Today’s scientific challenges involve tough problems and data amounts so large they’re measured in petabytes, or quadrillions of bytes. High-performance computing involves the use of supercomputers and computer clusters that can tackle difficult calculations and these large data sets. For example, the computers are enabling scientists at Princeton to model shock waves caused by supernova explosions, to explore the feasibility of carbon dioxide storage, and design a cheaper and more efficient fuel cell.

Such computers also help researchers understand the complexity of the human brain, how schools of fish decide which way to swim and how flocks decide which way to fly.

About 70 percent of the computing power at the new center is to be dedicated to high-performance research computing, while the other 30 percent runs the email, databases and other computing services needed to support campus. The computers were moved from computing facilities at 87 Prospect Ave., the New South Building and Lewis Library on the University’s main campus.

The high-performance research computers are part of Princeton’s existing TIGRESS High-Performance Computing Center and Visualization Laboratory in the Lewis Library. TIGRESS is short for Terascale Infrastructure for Groundbreaking Research in Science and Engineering. While the five computers that make up TIGRESS have been moved to the new building, the TIGRESS staff, educational resources and the visualization laboratory will remain in the Lewis Library on the main campus.

Two of the five computers are new additions, having been purchased to replace aging models. The two are Hecate, which has replaced an older machine with the same name, and Orbital, which replaces a five-year-old high-performance cluster known as Woodben. The new Hecate has 1,500 processors, providing roughly 1,000

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What’s inside?

Mueller, Jackson to receive top alumni awards

Volcanoes, meteorites combined to kill dinosaurs

University expands courses addressing ethics

Works of British painter Gwen John on view at library
Princeton to realign Facilities, University Services operations

Princeton's Office of the Executive Vice President has developed an organizational plan to realign responsibilities within the Facilities Organization and University Services to strengthen the institution's capacity to manage its facilities and provide critical services to members of the campus community.

Under the plan, Facilities will focus on stewarding Princeton's grounds and buildings, and University Services will focus on the provision of services, with each organization led by a vice president who will serve as a member of the president's cabinet. Both positions will report to Executive Vice President Mark Burstein.

The vice president for facilities will continue to lead departments and offices responsible for planning, operating and maintaining the University's physical space, while some of the service-based operations, such as Dining Services, Conference and Event Services, and the Real Estate Services, that previously operated within the Facilities Organization, will report to a newly created position of vice president for University Services.

The realignment plan was prompted by an assessment of the growth of both Facilities and University Services performed by the Office of the Executive Vice President. The assessment found that the expansion of the campus over the past 10 years — coupled with the real estate functions and management of the University's Forrestal Campus into the Facilities Organization — has significantly increased the scope of the work of Facilities. At the same time, University Services has also grown since its founding nine years ago and now includes service units that previously reported to various offices across Princeton's administration.

To streamline operations that provide daily services to faculty, students and staff, the vice president for University Services will supervise 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.

Michael McKay, who has served since 2003 as vice president for facilities, will continue to serve in his position, and will supervise the offices of 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 Training; and TigerCard, as well as facilities, which manages the Forrestal Center for the University; Real Estate Downspoint; and Sustainability.

An internal search for the University Services vice president will begin immediately, with the goal of presenting the candidate to the Board of Trustees well in advance of completing the reorganization by July 1, 2012.

Tim has proven his skill as a manager, a leader and a valuable administrator. We have been well served by Tim in the past, and I look forward to his participation in this new and expanded role.

Before joining the Princeton staff, Downs worked for Sanford-Brown College, a health care education institute, in Philadelphia, and he earned a master's degree in business administration from Temple University, he holds an MBA from the University of Delaware.

“Tim’s been fortunate to experience the dedication and commitment to excellence of the Facilities Organization,” said Downs. “Our clients and the community remains central to our mission. I appreciate the opportunity to take on an expanded role and continue my service and support to the University.”

Downs succeeds Ben Hammond, who is now the vice president for finance and administration and treasurer at Mount Holyoke College.

Timothy Downs has been appointed director of Facilities Finance and Administrative Services in Princeton's Facilities Organization. His appointment was effective Nov. 1.

As a member of the facilities senior management team, Downs oversees a variety of financial, administrative and systems-related projects. His areas of responsibility include budget and finance, contracts administration, materials management, process improvement and information systems, including geographic information systems.

A Princeton staff member since 2007, Downs has served most recently as manager of budget and finance within Facilities Finance and Administrative Services.

“I am extremely happy that the assessment agreed to take this position and the associated responsibilities,” said Michael McKay, vice president for facilities, to whom Downs reports. “Over the past five years, effective Aug. 1, 2012. Currently a postdoctoral research associate at Princeton, Valenzuela is a graduate of the University of California-Los Angeles and holds a Ph.D. from Stanford University. His research focuses on American politics.

In electrical engineering, David Wentzlaff began a postdoctoral research associate position and the associated responsibilities, said Michael McKay, vice president for facilities, to whom Downs reports. “Over the past five years,”

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Employee obituaries

Retired employees


Deadline

The Princeton University Bulletin is published monthly from September through June to coincide with the academic year. The Bulletin is published by the Office of Communications, 22 Chambers St., Suite 201, Princeton, NJ 08542. Questions or concerns regarding the Bulletin may be directed to csmith@princeton.edu. Periodicals postage paid at Princeton, N.J. (USPS-445-080). The Princeton University Bulletin (© 2011 The Trustees of Princeton University) is published monthly from September through June to coincide with the academic year. The Bulletin is published by the Office of Communications, 22 Chambers St., Suite 201, Princeton, NJ 08542. Questions or concerns regarding the Bulletin may be directed to csmith@princeton.edu. Periodicals postage paid at Princeton, N.J. (USPS-445-080).
Mueller, Jackson to receive top alumni awards

Paul Karr

Princeton will present its top honors for alumni to Robert S. Mueller III, on the Board of the FBI, and Lisa Jackson, administrator of the Environmental Protection Agency. Mueller, a member of the Class of 1966, will receive the Woodrow Wilson Award. Jackson, who earned a master’s degree in chemical engineering in 1986, will receive the James Madison Medal. They will be presented with the awards and deliver addresses on campus during Alumni Day activities on Saturday, Feb. 23.

The Wilson Award is bestowed annually by the University upon a person with an undergraduate-alumna or alumnus whose career embodies the call to duty in Wilson's famous speech, “Princeton in the nation’s service.” Jackson serves as President of the University and also president of the United States.

The Madison Medal, established by the Association of Princeton Gradu- ate Alumni, is named for the fourth president of the United States and the president of many other alumni of Princeton’s first graduate student. It is presented each year to either a graduate or alumna of Princeton's faculty who has had a distinguished career, advanced the cause of graduate education or achieved an outstanding record of public service.

Wilson Award winner

Mueller is regarded as the chief driving force behind the FBI's shift from an organization primarily focused on investigating criminal activity to a national security service that uses intelligence to safeguard the nation from a much broader international terrorist and criminal threat landscape.

Easton, from Chicago, earned a bachelor’s degree in ecology and evolu- tionary biology as a palms to study a doctorate in infectious disease epide- miology at Imperial College London. Easton is committed to working in public health, building from her research and work experience in India, an interest that was fos- tered during her years at Princeton. Recently, she has focused on the public health challenges of disease resistance to antibiotics.

More on the Web

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

• Building on its 30-year history of developing one of the nation’s leading pro- grams in Hellenic studies, Princeton has established the Stanley J. Seeger ’52 Center for Hellenic Studies to consolidate and expand its research activities, international initiatives, scholarly exchanges and offerings in the class- room. The Program in Hellenic Studies, founded in 1981, enrolls about 200 undergraduate and graduate students a year in academic study and supports more than 100 Princetonians for international travel, study and research. The new center will enhance the Hellenic Studies Program’s standing in new academic positions, adding faculty members, strengthening the graduate cur- riculum and expanding study abroad opportunities.

• The first climate study to focus on variations in daily weather conditions has found that extreme weather can vary more than daily on average around three days, which is significantly higher than the average of about two days.

• Princeton researchers have developed — and successfully tested — a technique for reducing all light transmission. In an irony of nature, invasive species can become essential to the very ecosystems they helped eliminate. In the United Kingdom, where she previously studied at Oxford for the 2011 spring semester, she will broaden her research on ART data, which she believes can be used to improve current fertility treatments. In particular, her approach to counter- terrorism and security challenges requires policies that uphold human rights.

Rutherford, a history major from Sand Diego, plans for a master’s degree in British and European history at Oxford.

Rutherford, who has an application to become a professor, has had a lifelong love of literature. Recently, for her senior thesis, she has focused on the intellectual history of sexual identity in Victorian Britain.

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A cosmic one-two punch of colossal volcanic eruptions and meteorite impacts likely caused the mass-extinction event at the end of the Cretaceous period that is famous for killing the dinosaurs 65 million years ago, according to two Princeton reports that reject the prevailing theory that the extinction was caused by a single large meteorite.

Princeton-led researchers found that a rare combination of extremely powerful meteorite impacts and massive eruptions 65 million years ago, a primate volcanic range in western India that was once three times larger than France. A second Princeton-based group uncovered traces of a meteorite close to the Deccan Traps that may have been one of a series to strike the Earth around the time of the mass extinction, possibly wiping out the few species that remained after thousands of years of volcanic activity.

Researchers led by Princeton Professor of Geosciences Gerta Keller recently reported in the Journal of the Geological Society of India that the Chicxulub meteorite was instead the principal agent of environmental change at the end of the Cretaceous mass extinction. Until recently, the theory was in question because the Chicxulub impact was not powerful enough to have caused the KT mass extinction event. They concluded that the analysis was conducted in important sections near the volcanic action, and not thousands of kilometers away as had been the case previously," Courtillot said. "They provide support for the idea that carbon and sulfur dioxide emissions were the principal agents of environmental change and stress, and conclude that the characteristics of the second-phase eruptions were such that it could alone have caused the mass extinction."

"The significance of this recent work is that the analysis was conducted in important sections near the volcanic action, and not thousands of kilometers away as had been the case previously," Courtillot said. "They provide support for the idea that carbon and sulfur dioxide emissions were the principal agents of environmental change and stress, and conclude that the characteristics of the second-phase eruptions were such that it could alone have caused the mass extinction."

Keller and her co-authors examined sediments trapped between Deccan lava flows to reveal that a species known as planktonic foraminifera — widely used to gauge the severity of prehistoric disasters — succumbed to lava mega-flows and volcano-induced environmental stress such as acid rain and drastic climate changes. As conditions on Earth worsened, large, varied species (left) were eliminated. The no more than seven or eight smaller species (right) that remained dwarfed further.

Geological Society of India that marine sediments from Deccan lava flows show that the population of a planktonic species widely used to gauge the severity of prehistoric disasters — succumbed to lava mega-flows and volcano-induced environmental stress such as acid rain and drastic climate changes. As conditions on Earth worsened, large, varied species (left) were eliminated. The no more than seven or eight smaller species (right) that remained dwarfed further.

Keller, who is lead author of the Geological Society paper and second author of the EPSL paper after lead author Brian Gertch, who earned his Ph.D. from Princeton in 2010. Gertch is now a postdoctoral researcher at the Massachusetts Institute of Technology.

"We demonstrate a clear cause-and-effect link between massive volcanic eruptions and the KT mass extinction event — known as the Cretaceous-Tertiary, or KT, for the periods it straddles — was triggered solely by a large meteorite impact near present-day Mexico in present-day Mexico. That impact — which occurred around the time of the second-phase eruptions — is thought to have been 2 million times more powerful than a hydrogen bomb and generated an enormous dust cloud and gases that radically altered the climate. Keller has long held that the Chicxulub impact was not catastrophic enough to cause the KT mass extinction — the newest work from her lab, however, shows that the largest Deccan eruptions were."

"The tone of the researchers’ ‘impressive analysis’ confirms the timespan of Deccan eruptions and environmental fallout reported in recent years by various research teams, including his own," Courtillot said, who is familiar with the Princeton work but had no role in it, led the team that reported in the Journal of Geophysical Research in 2009 that Deccan volcanism occurred in three phases, the second and largest of which coincides with the Cretaceous-Tertiary mass extinction; the Keller-led study published in the Journal of the Geological Society of India confirms the second and third phases, he said."

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Frist hosts Winterval celebration

Princeton students, faculty and staff are invited to celebrate the upcoming winter season at the Frist Campus Center’s annual Winterval from 3 to 5 p.m. Wednesday, Dec. 14, on the center’s 100 level. This year’s festival will include a dessert and beverage buffet, fondue and hot chocolate, and a snowmobile simulator. Guests are also invited to participate in several activities such as holiday card making, candy house building, cookie decorating and gift-wrap making.

The Undergraduate Student Government will be present to promote and provide information for its Campus Community Challenge, an initiative launched earlier this year to encourage students to participate in community service. More information on the Campus Community Challenge may be found at ccc.tigerapps.org.

Frist will also serve as one of several collection sites for the Mercer Street Friends Food Bank. University members may drop off donations of nonperishable food and personal hygiene items near the main Family Game Room on the 100 level during regular operating hours through Friday, Dec. 16. For a listing of other campus collection sites, visit the Office of Community and Regional Affairs website at www.princeton.edu/community.

Winterval is co-sponsored by the Frist Campus Center and Dining Services. For more information, visit www.princeton.edu/Frist.
University expands ethics education for future researchers

Usha Patel and Steven Schultz

Once a part of undergraduate education, ethics courses have become increasingly important as society, industry, and government investment in research have expanded. As a result, students have a greater role in the research process and must be more aware of ethical responsibilities. This shift has led to an increased emphasis on ethics courses, trainings, and resources. As of 2010, RCR courses are required for federally funded students and post-doctoral researchers in the natural sciences, engineering, and the social sciences. These courses are designed to teach students about research misconduct, responsible authorship, and the broader societal implications of engineering decisions.

In a research ethics course from last fall, electrical engineering graduate students Yue Tian (left) and Tiance Wang (right, with clicker) “vote” on a multiple-choice question about a hypothetical ethical dilemma.

Claire Gmachl, the Eugene Higgins Professor of Electrical Engineering, teaches “Responsible Conduct in Research: A Course on Ethics in Engineering,” a half-semester course that provides a brief background in moral philosophy, the course covers topics such as research misconduct, and authorship in publications, student-adsor and more frequently need to probe their own research, he said. “But as an engineer you really do have an ethical responsibility because your work really impacts society, whether you know it or not.”

Lessons in life sciences

The National Institutes of Health began asking their grant applicants about RCR in 1989 and started requiring such plans in 1994. To satisfy the RCR requirement, Princeton’s molecular biology department developed the graduate course “Scientific Integrity in the Practice of Molecular Biology,” which Lee Silver began teaching in 2005. Silver, a professor of molecular biology and public affairs, has focused his research on the ethical and social implications of advances in reproductive technology and genetics. His RCR class, however, covers issues of personhood, integrity rather than societal questions.

“What is appropriate or inappropriate in terms of doing research, reporting research, using the ideas of another researcher, and what to do if a grad student suspects another researcher of misconduct?” Silver said, framing some of the central questions of the course.

Other issues covered in the course include the framework for public support of basic biomedical research, the rights and responsibilities of students and researchers, intellectual property, and dealings with human and animal subjects.

Silver uses case studies and class discussion to convey the material. This spring, he also sparked discussion on ethical dilemmas with videos recently produced by the Office of Research Integrity in the U.S. Department of Health and Human Services.

While students often have the most passionate discussions about the issue of how credit for collaborative experiments is divided in research publications, Silver said students will mostly need to probe their own actions in the lab.

“The most important issue is how to guard against unintentional bias or misconduct in one’s own research,” he said.

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Due to the RCR program, Claire Gmachl, the Eugene Higgins Professor of Electrical Engineering, has introduced students to the complex professional and societal implications of conducting research and bringing new technologies to market. Gmachl volunteered to teach “Responsible Conduct in Research: A Course on Ethics in Engineering,” a new half-semester course required of all engineering graduate students. In addition to providing a brief background in personal and institutional practices. Topics covered vary according to the nature of the research in the discipline. Issues of animal welfare are relevant to graduate students in the areas of veterinary medicine, and campuses in computer science. From intensive two-day summer courses to half-term classes during the academic year, the University’s departments have established a variety of ways to engage students in research ethics.

Ethics in engineering

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Amanda Hiszpanski, a graduate student in chemical and biological engineering, took the new class “Responsible Conduct in Research: A Course on Ethics in Engineering” last fall to gain insights into her ethical responsibilities as a researcher.

“The course made me more conscious of ethical choices and situations I face on a day-to-day basis as a graduate student and researcher,” she said.

More than simply identifying possible pitfalls, it also offered advice on how to navigate and avoid ethical dilemmas.

For many years, Princeton has offered courses about conducting research ethically in the life sciences because of federal funding guidelines, and the University now has extended its commitment to this training to all of the natural sciences, social sciences, mathematics, and engineering departments. Princeton’s Dean for Research A.J. Stewart Smith and Dean of the Graduate School, has introduced such plans in 2003. To satisfy the RCR requirement, Princeton’s molecular biology department developed the graduate course “Scientific Integrity in the Practice of Molecular Biology,” which Lee Silver began teaching in 2005.

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Silver uses case studies and class discussion to convey the material. This spring, he also sparked discussion on ethical dilemmas with videos recently produced by the Office of Research Integrity in the U.S. Department of Health and Human Services.

While students often have the most passionate discussions about the issue of how credit for collaborative experiments is divided in research publications, Silver said students will mostly need to probe their own actions in the lab.

“The most important issue is how to guard against unintentional bias or misconduct in one’s own research,” he said.

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A focused approach in history

As an example of exploring ethics in the social sciences, and the history of science were engaged in an intensive workshop that is a part of the new course “Research Ethics and the Disaster Prospectus.” The course is co-taught by 10 professors, with one or two of them leading each session. The bulk of the class focuses on students’ proposed research materials, issues and structures for their dissertation. The RCR workshop, however, offers an opportunity to discuss topics of ethical concerns, including identifying original research and setting research agendas; obligations to patrons, including the public, and conflicts of interest; problems such as bias in sources, attribution of scientific discovery and processing; human subjects, oral history and intellectual property; collaborative research; responsible authorship and peer review; research misconduct; mentoring, bullying, harassment and stereotyping in professional relationships; standards and research across fields; history in society; and teaching ethical practice to undergraduates. Professor of History and Hellenic Studies John Haldon, who devised the course together with Professor of History Angela Creager, said the timing and structure of the class, to be offered annually, are meant to maximize the impact on graduate students, who have just finished their general exams and are preparing to begin their dissertations. “It usefully precedes their dissertation prospectus seminar in June, and we minimize the demand on faculty,” Haldon said. “It also immediately precedes most post-graduates second-year students setting off for their first big extended research trips, so it’s useful for them to be forearmed about issues that may arise and how to deal with them or where to go to get advice or assistance.”

Expanding RCR courses to the social sciences has been a useful and popular move, Haldon said, based on the level of engagement exhibited by students in last summer’s class. “A number of faculty opens up the debate, and the discussion then generally runs itself because the students effectively take over,” he said. “Once the students get to grips with the themes, they are usually extremely keen to push the discussions further.”

Dinosaurs

The first mega-flow, and no recovery occurred between subsequent mega-flows. By the end of the fourth mega-flow the mass extinction was complete, the researchers wrote. The vast amounts of carbon dioxide and sulfur dioxide poured into the atmosphere by the end of the second volcanic phase — estimated to be 30 times more than the levels produced by the Chicxulub impact — resulted in, among other things, hyperoxic acid rain, acidic oceans and global temperatures that swung between scorching and frigid, the researchers stated.

Ethics

Teaching award nominations sought

The Office of the Dean of the Faculty invites members of the University community to submit letters of nomination for the 2012 President’s Award for Distinguished Teaching.

The awards, presented annually at Commencement, are intended to recognize excellence in undergraduate and graduate teaching by Princeton faculty members. All current full, associate and assistant professors, seniors lecturers and lecturers who have served at least half time for three or more years are eligible for nomination.

Letters of nomination should be sent by Monday, Feb. 13, to the Office of the Dean of the Faculty, 9 Nassau Hall, or to patd@princeton.edu.

Evidence that a large meteorite helped finish the job

For the paper published Oct. 15 in EPSL, Keller and her co-authors provide a supporting and more nuanced depiction of conditions during the Deccan period. They examined sediments from an ancient shallow sea in Meghalaya where rock layers are known to contain among the clearest fossil records of the Cretaceous-Tertiary mass extinction, Keller said. She worked with lead author Gertsch; the geologist Adatte; Rahul Garg and Vandana Prasad from the Birbal Sahni Institute of Palaeobotany in India; Zolt Berner from the Karlsruhe Institute of Technology in Germany; and Dominik Fleitmann at the University of Bern in Switzerland.

Analysis of the Meghalaya sediment revealed an inhospitable planet rife with high humidity, severe storms and massive blooms of the plankton species Guembelitria crestacea, a disaster opportunist that flourished in devastated environments when few other species survived. At the same time, the team detected large amounts of iridium, an element typically associated with meteorite impacts, Keller said. Iridium is rare on Earth yet is found in high concentrations in the KT boundary, a phenomenon known as the iridium anomaly. Remnants of iridium at the KT boundary in Meghalaya coincide with the global KT boundary iridium anomaly, she said. The new evidence of a meteorite strike at Meghalaya that coincides with the KT mass extinction supports the theory Keller proffered in 2003 that multiple meteorites struck the Earth around the time of the Deccan eruptions, adding to the volcano-fueled misery of the mass-extinction era.

“Data suggest that the mass extinction of the dinosaurs and other species was caused by the harsh conditions resulting from massive Deccan eruptions and the coincidence of multiple meteorites,” Keller said. “In light of this new evidence, the single-impact story seems more like an article of faith than a fact.”

The study published in the Journal of the Geological Society of India about the Deccan eruption and the meteorite research published in EPSL were both supported by grants from the National Science Foundation.

Dinosaurs

The area known as the Deccan Traps — a primeval volcanic range in western India that was once three times larger than France — is the source of evidence found by Princeton researchers that has led to new understanding of the demise of the dinosaurs.

Image courtesy of Gerta Keller

Alumni

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Computing
Continued from page 1

According to astrophysicist Anatoly Spitkovsky, Princeton’s high-performance computing resources allow researchers to “study the most precise acceleration and heating of particles by supernova remnants and gamma-ray bursts.” This image shows the simulation of the structure of magnetic turbulence near an astrophysical shock wave, propagating toward the lower right corner of the image. Collisions of clouds of plasma in space cause the shock waves, generate magnetic fields and accelerate particles. Ejected pockets of plasma are created ahead of the shock as newly accelerated particles and are surrounded by filaments of generated magnetic field. Ahead of the shock by newly accelerated particles and are surrounded by filaments of generated magnetic field.

Researchers can also access a list of trainings and mini-courses on how to use the computing resources. Technical support staff are available to help researchers decide which computer system fits the job, troubleshoot malfunctions, and tune software for maximum performance. “This lowers the technological barriers,” said Curt Hillegas, director of research computing and director of TIGRESS.

Computer simulations can help researchers explore this question, said Pablo Debernardi, the Class of 1950 Professor in Engineering and Applied Science and vice dean of the School of Engineering and Applied Science; He and his team use Princeton’s computing power to type a model of a Monte Carlo simulation to look at how molecules of carbon dioxide, water and salt interact with each other at high temperatures and pressures.

“This is the sort of complicated research question that you can ask in a university environment, and it would be impossible without high-performance computers,” Debernardi said.

Meeting researchers’ needs on demand

The centralized approach enables such high-performance research to be successful because it starts with the needs of Princeton research groups, said Avishai Ostriker, professor of astrophysical sciences and PICSciE’s director until July 2009. “The researchers and faculty members decide what types of computers they need. For example, some computers are good at visualization while others, a higher throughput, in terms of computations per second.”

“The savings are also substantial, said Ostriker, who was a leading proponent of the centralized approach when he served as Princeton provost from 1995 to 2001. Prior to the centralized approach, individual departments were buying and installing research computers in their own buildings.

Installing high-performance computers in individual departments is expensive because the computers consume large amounts of power, generate a lot of heat and require installation of dedicated air conditioners. Often the power supply to campus buildings, especially older ones, was not designed to handle the electrical wiring and cooling infrastructure needed.

Combining research computing and campus computing made sense, Ostriker said. A centralized computer facility requires funding, but is tied to a system in which each department had to hire its own computer administration. The new approach, supported by three OIT employees, a data center facilities manager and two electronics specialists, is less expensive.

This external staff support aids the work being done by such researchers as Professor of Chemistry Annette Selloni and her group, which is exploring hydrogen generation from water in the search for better and cheaper energy sources. The researchers are using computer modeling to design a catalyst that extracts protons from water and combines them with electrons to produce hydrogen. An essential piece of the catalyst is currently based on pricy and rare metals such as platinum. “We are exploring via computer modeling whether a cheaper and more efficient catalyst can be cycled,” Selloni said.

The team’s in silico modeling efforts are inspired by a real-life microbial enzyme isolated from hydrogen-producing bacteria. But creating a catalytic functional cata-

lyst based on a natural enzyme is no trivial matter, and requires a basic understanding of the processes involved.

“Our research requires highly sophisticated quantum-mechanical computations,” Selloni explained. “These types of calculations can be carried out only on computers like those at Princeton in their Performance Computing Research Center.”

Another of the user groups for the computing facility is the Department of Energy’s Princeton Plasma Physics Laboratory (PPPL), which is managed by the University. “This computing facility is one of the strengths of being located within the Princeton University neighborhood,” said Michael Zarnstorff, deputy director for research at PPPL. “By pulling together we can get a facility that is beyond our ability as individual groups.”

In addition to applications in engineering and physics, high-performance computing is being increasingly used in disciplines that until recently required little more than a desktop. In the Department of Ecology and Evolutionary Biology, Assistant Professor Iain Couzin is using computer approaches to understand how complex behaviors such as bird migrations and insect swarms emerge from actions and interactions among individuals. His team of researchers has developed a computational tool to explore how behaviors of individual organisms, while sensing only their local environments, can adaptively contribute to cooperative behaviors. The researchers have developed a model of how collective behavior triggers, and have even tested responses to ecological conditions.

Keeping cool with an eye on sustainability

To support such hefty computing jobs, the new facility at Forrestal was specially designed to provide power to the computers while using as little energy as possible. The entire ground floor of the building is dedicated to maintaining the computers. One part of the floor is dedicated to electrical substation, the other to power supplies in the form of large batteries and another to creating the cool air that will maintain equipment temperatures. Of all the features in the new For-

restal computing research center, a computerized control system may be the most important, Hillegas said. “Anyone who has used a laptop knows that computers generate a lot of heat. Most personal computer systems generate massive amounts of heat.” Three massive water coolers, each capable of evaporation of thousands of gallons of water per day to a temperature of about 45 degrees Fahr-

cenheit. The natural gas generator will air that is propelled by fans into and out of the second-floor computer room to keep the machines comfortably at room temperature.

In case of a power failure, a 100,000 gallon tank of pre-cooled water stands next to the building, ready for use until a backup generator rumbles to life. Water is used extensively, said Edward Borer Jr., manager of the University’s utilities. “We have tank full of cold water that we can immediately circulate into the data center to start removing heat,” he said.

On the second floor stand rows of cabinets that house the computer serv-

ices. Each generates as much as 200 continuously burning light bulbs packed into a space the size of a kitchen refrigerator. To offset these cooling and power needs, the building has many energy-saving features. For example, the air conditioning system can be switched off, and giant louvers on the south facade are opened to let cold air outside. This feature takes advantage of modern technical standards that use refrigeration to cool the building instead of refrigerating the air. The savings are also substantial, said Borer. These features include cooling towers that enable the chillers to be turned off when the outside temperature is near freezing. A second backup generator, this one gas-powered, has a cogeneration feature that captures the heat as well as the electricity produced. “This external staff support aids the work being done by such researchers as Professor of Chemistry Annette Selloni and her group, which is exploring hydrogen generation from water in the search for better and cheaper energy sources. The researchers are using computer modeling to design a catalyst that extracts protons from water and combines them with electrons to produce hydro-

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