All Things Great and Very, Very Small

The field of particle physics was born with the discovery that atoms are not indestructible but rather consist of smaller subunits that may be isolated and controlled individually. Cosmology—the study of the origins of the universe—may be said to have begun with the startling revelation that there are many galaxies other than our own. Particle cosmology, the synthesis of these two fields, recognizes that many aspects of the early universe can be described with models of particle physics and vice versa.

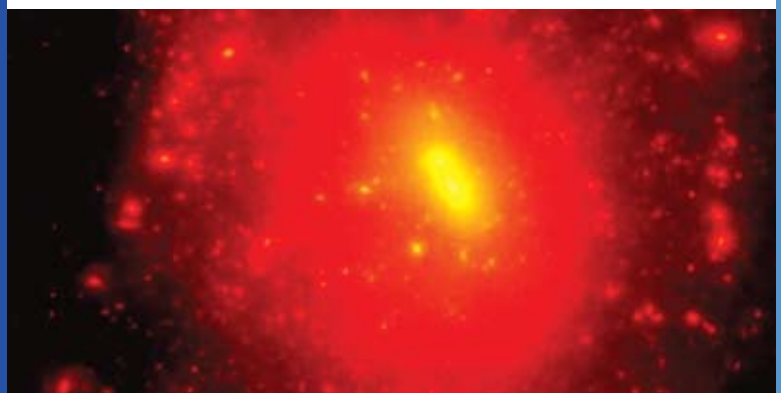
With Penn positioned to be a major force in new interdisciplinary efforts in physics, the establishment of the Center for Particle Cosmology provides a crucial component needed to empower University researchers to advance our understanding of the universe. While a number of other top-flight institutions have strong groups in both physical cosmology and theoretical physics, Penn's recent investment in faculty who connect these two areas sets the University apart from many of its peers.

"The connection between particle physics and cosmology is becoming a deep and lasting one and is expected to be a frontier field in physics for decades to come," says Mark Trodden, Professor of Physics and Astronomy and co-director of the center.

Recently recruited from Syracuse University, Trodden is an internationally recognized expert whose work includes the development of the modified gravity approach to cosmic acceleration, as well as approaches to dark matter and dark energy. Trodden joins center co-director Bhuvnesh Jain, an associate professor of physics and astronomy and a leading expert in gravitational lensing. The Center for Particle Cosmology's other members include Penn physicists Vijay Balasubramanian, Mirjam Cvetic, Burt Ovrut, Ravi Sheth, and new faculty recruit Justin Khoury.

For more information, visit www.physics.upenn.edu/particlecosmo/.

—BDS



Brenda Casper

Climate Change in Mongolia

Last summer, a group of College students accompanied Professor of Biology Brenda Casper, Assistant Professor of Biology Brent Helliker, and Assistant Professor of Earth and Environmental Science Alain Plante to northern Mongolia. They went to study the ecological and evolutionary consequences of climate change in the Lake Hövsgöl region.

There, the researchers set up passive warming chambers that trapped infrared radiation and increased the temperature of the air and soil they contained. They also worked with the region's nomadic herders to see how the grazing patterns of livestock were affecting the area. Additionally, Helliker led a study examining oxygen isotopes in tree-core samples to reveal information on past temperatures in the area. Data from the fieldwork will help scientists predict the impact of future climate change on the area's plants and soil.

The excursion was part of a project funded by a $2.5-million grant from Partnerships for International Research and Education (PIRE), a program of the National Science Foundation, which fosters cultural exchange between U.S. and foreign institutions by establishing models for international collaborative research and education. The field trip—the project's first—also included collaborators from the Academy of Natural Sciences in Philadelphia and faculty and students from the National University of Mongolia.

Biology professor Peter Petraitis, one of the project's principal investigators, says PIRE Mongolia "can help train Mongolian scientists and students to be international players in research, while giving our own undergraduates a firsthand appreciation of both scientific and cross-cultural fieldwork."

—PR

Rasputin Homecoming

Last October, at the Helikon Opera in Moscow, music professor Jay Reise sat with a Russian audience who watched a performance of *Rasputin*, the opera whose score and libretto he had composed. A cast of Russian superstars brought to life the two-act opera about the dramatic rise and fall of Russia's "mad monk." *Rasputin* was originally commissioned by Beverly Sills and the New York City Opera in 1988—the *Washington Times* called it "profoundly beautiful"—but the premiere at the Helikon was the composition's first performance in the Russian language.

"Since high school, I have had an ongoing admiration for the richness and sophistication of Russian culture," Reise says. "For me, it had a special meaning that the opera was done in Russian for its Moscow premiere, and I must say, I now prefer the Russian-language version."

One of the sets for the Helikon staging used giant Fabergé eggs to illustrate the delicate world of the tsar and the royal family in contrast to the rough-hewn lives of the peasants and workers who overthrew the aristocracy in the Russian Revolution. The opera is based on historic events, but Reise says he relied more on the legend of Rasputin and his influence on the royal household to tell the story. In the final scene, the murder of the tsar and his family is accompanied by a raging Lenin (hatched from a Fabergé egg), a frenzied crowd and a climactic atonal score.

"History, politics and opera are taken very seriously in Russia," Reise reports. "Tickets for the remaining four performances were sold out the morning after the premiere."

—PN

Best Brain Builds Better Molecule

Associate Professor of Chemistry Jeffrey Bode was named one of *Discover* magazine's "50 Best Brains in Science, 2008" for developing a new way to build peptides—molecules formed by linking amino acids. This finding could improve the production of expensive peptide-based drugs, which include the diabetes medicine Byetta and the HIV treatment Fuzeon.

"In established methods of creating peptides, you have to string individual amino acids together, like pearls on a string," Bode explains. Because the reactions involved in these methods are highly sensitive, it is difficult to manufacture peptides with the length and purity required for use in pharmaceuticals. In addition, the chemicals needed for such reactions result in an enormous amount of waste.

Bode discovered a chemical reaction that creates amide bonds—the key linkage between amino acids—in a way that allows for the synthesis of smaller peptides into larger ones. The reaction is unique because it works in water, isn't sensitive to surrounding compounds and doesn't generate chemical byproducts. Beyond its potential benefits for pharmaceutical production, it may also be applied in the development of new biocompatible materials, with uses ranging from diagnostics to drug delivery to wound healing.

"One reason this finding has generated so much excitement is because it came out of very basic research, but it has immediate practical applications," says Bode, who came to Penn in 2007 from the University of California, Santa Barbara. "We had to take a step back and think about the fundamentals of how amide bonds are made. In the process we discovered something that, in the long run, will be much more powerful than what is out there now."

—PR

Loosening the Shackles of Caste

Penn's Center for the Advanced Study of India (CASI) is funding and designing the largest non-government study of economic gains made by India's Dalit caste. Dalits comprise about one-sixth of the country's population and historically have been at the bottom of the complex social hierarchy that constitutes the caste system. The research will help address one of the major challenges facing contemporary India—how to extend the benefits of its economic growth and development to this and other marginalized social groups.

A major component of the study is a qualitative survey, conducted in spring 2008, of 20,000 households in the Indian state of Uttar Pradesh. It was led by Chandra Bhan Prasad, a leading Dalit thinker and political commentator in India today. Prasad began his partnership with the center when he was invited to spend a year at Penn as part of the CASI Visiting Scholar/Fellows Program.

"Chandra Bhan Prasad has been at the forefront challenging conventional wisdom about the economic empowerment of Dalits, which has basically centered on state-led initiatives," says Devesh Kapur, director of CASI and Madan Lal Sobti Associate Professor for the Study of Contemporary India. "He believes modern technologies, capitalism and markets do more than the state to weaken the link between caste and occupation—a key mechanism by which caste is perpetuated."

The survey tests this theory by comparing a host of variables about the lives of Dalits in 1990—the year before India launched major efforts to liberalize its economy—and in 2008. CASI worked with Prasad and other Dalit scholars to design questions, and Prasad enlisted members of the Dalit community to administer the survey on the ground.

CASI researchers are currently analyzing the enormous volume of resulting data, but preliminary results show that Dalits reported significant positive changes in their lives. However, Kapur cautions, "We cannot yet attribute this improvement primarily to economic reforms because there have also been other simultaneous changes, such as major political empowerment of Dalits." And he explains that there is still a long way to go in countering the longtime marginalization of this community. But Kapur says, "From the survey, we can say confidently that the trend is positive."

—PR

Candace di Carlo

New Fels Director a Civic Connector

David Thornburgh has been named the new executive director of the Fels Institute of Government. He succeeds Donald Kettl, the Robert A. Fox Leadership Professor of Political Science, who has returned to full-time research and teaching.

"With his deep and rich background in public finance, David Thornburgh stands in the rich tradition of Fels and its 70 years of leadership for results," says Kettl of his successor. "He's ideally positioned to help the institute take the next step in its history."

Boasting a distinguished record of leadership and entrepreneurship in economic development and civic affairs, Thornburgh comes to Fels from the Econsult Corporation, a Philadelphia-based regional economic consulting firm, where he worked as a senior advisor. In 2006 through 2007, Thornburgh served as CEO of the Alliance for Regional Stewardship, a national best-practice network of public- and private-sector leaders committed to building globally competitive regions. He was also executive director of the Pennsylvania Economy League in Philadelphia from 1994 through 2006, and he served as director of the Wharton Small Business Development Center at Penn from 1988 through 1994.

"Fels has built a tremendous legacy of educating effective leaders for public service," says Thornburgh. "At a time when our economic, environmental and social challenges demand thoughtful and energetic leadership, I expect Fels will play an even greater role in shaping public policy and management at the regional, national and international levels."

Thornburgh holds a B.A. from Haverford College and a master's degree in public policy from Harvard's Kennedy School of Government. He is a frequent commentator on public policy and regional development issues and has been recognized by Leadership Philadelphia as one of the 101 most trusted and respected civic "connectors" in the area.

—BDS

Just Representation

Established in 2007 with a start-up grant from the Andrew W. Mellon Foundation, the Penn Program on Democracy, Citizenship and Constitutionalism (DCC) kicked off its second year at the National Constitution Center with a panel discussion on this year's highly topical theme, Civic Representation, Elections and Public Opinion. The 2008–09 DCC workshop series and spring conference are dedicated to exploring the challenges facing those striving to achieve just, effective representation in modern electoral systems and representative bodies. Special attention is being paid to the roles of mainstream and emerging media. This year's DCC fellows include scholars pursuing research in multiple disciplinary areas, among them doctoral candidate Phillip Buckley, who for three years served in the U.S. Department of State English Language Fellowship Program teaching at law schools in Ukraine and Serbia. Georgia Kernell, this year's DCC postdoctoral fellow, is working on several projects examining institutions that regulate political-party diversity. In the spring she will teach a freshman seminar on comparative political parties and party systems.

—BDS

National Constitution Center

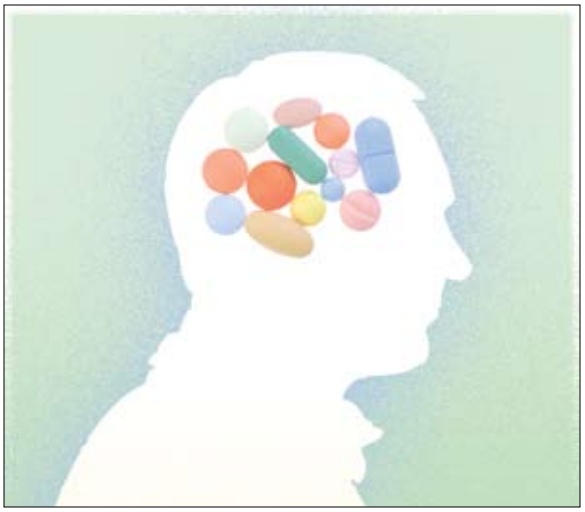
Therapy vs. Meds

A groundbreaking study on the effects of cognitive therapy by Robert DeRubeis, Professor of Psychology and Associate Dean for the Social Sciences, and Steven Hollon at Vanderbilt University has continued to generate new findings since its initial publication in 2005.

Published in the *Archives of General Psychiatry*, the 2005 paper showed that cognitive therapy worked just as well as antidepressants in treating depression, challenging the American Psychiatric Association's guidelines that antidepressant medications are the only effective treatment for moderately to severely depressed patients. It found also that cognitive therapy was more effective than medication at preventing relapses after the end of treatment.

The study, involving 240 patients with moderate to severe depression, was the largest trial to date on the subject. "Because it was such a big study," DeRubeis says, "we have lots of very interesting data on a range of variables." As a result, several papers have subsequently been published on different aspects of these data.

Penn psychology doctoral student Yan Leykin, along with DeRubeis and a team of researchers, explored the difference in how patients with zero, little or extensive experience with antidepressant medication responded to cognitive therapy and medication. Their findings, published in 2007 in the *Journal of Consulting and Clinical Psychology*, revealed that although the two treatments are equally effective in patients who have taken medications for little or no time, cognitive therapy is significantly more effective in patients who have tried medications extensively.



In a paper published this year in the *British Journal of Psychiatry*, Jay Fournier, also a Penn psychology doctoral student, and DeRubeis found that medication was more effective for depressed patients with personality disorders and that cognitive therapy was more effective for those with depression alone. And, currently under review for publication at the *Journal of Consulting and Clinical Psychology*, is research that finds that cognitive therapy is more effective than antidepressants for those who are married or cohabiting and for those who are unemployed.

"These findings certainly have practical implications in terms of treatment," DeRubeis says. "But from a theoretical standpoint, we have to ask ourselves as scientists, what is it about the match between the medication and therapy and these variables that makes them effective or ineffective treatments?"

—PR

More details on DeRubeis' research can be found at www.sas.upenn.edu/derubeis.

Ryan K. Morris / NSTMF

Mettle Yields Medal

Penn physicist Fay Ajzenberg-Selove was among eight recipients of the 2007 National Medal of Science at a White House ceremony on September 29, 2008. Ajzenberg-Selove, a professor emerita who came to Penn in 1970, spent decades contributing to significant advances in the field of nuclear physics. Her principal work on understanding light nuclei—the elements of stars—is considered a global reference.

Born of Russian ancestry in Berlin, Ajzenberg-Selove fled Europe with her family during World War II, arriving in the United States when she was 15 years old. She received her bachelor's degree in engineering physics in 1946 and her doctorate in physics in 1952. A pioneer in a male-dominated field, Ajzenberg-Selove was often the only female in her undergraduate and graduate classes, going on to become the first female physics instructor and researcher many institutions had ever seen, including the California Institute of Technology, Columbia University and Haverford College.

—BDS

THE UNEASY TRANSITION FROM CAMPAIGNING TO GOVERNING

by Donald F. Kettl

Matthew Leake / PhotoDisc

Whew! The presidential-election campaign that seemed like it would never end changed overnight into the most difficult presidential transition since Franklin D. Roosevelt. Barack Obama championed "change," but he comes to office without having built support in the campaign for the tough policies he's going to have to manage.

This campaign's "October surprise" came in September, with the financial meltdown. In the closing weeks of the campaign, the candidate knew—even though he could not admit it—that the promises he had been making for almost two years had been knocked out the window. In fact, the easiest job in Washington in the days after the election was giving the president-elect his first budget briefing: "Congratulations, Mr. President-Elect. Here's the picture—there's no money."

Everyone wants the Iraqi war to end, but the country can't walk away. Everyone now realizes that the Afghan war is going to prove far more difficult than defense planners had hoped. And most importantly, the financial crisis is going to demand the president's sustained attention for at least the first two years of the Obama administration.

How can President Obama push aside his campaign's promises for tax cuts and health reform without breaking voters' hearts? Voters' expectations for change are high. They're sure to get change but maybe not what they had in mind. Righting the economy is job one, but it's going to be a slow and tough and incredibly complex job.

The financial crisis wasn't just a Wall Street or even a Main Street problem. As whole countries from Iceland to Pakistan teetered on the edge of bankruptcy, we quickly learned that

the problem was global. The solutions will require redefining government's role in the private sector, and they will need to be international in scope to avoid creating new cracks that further undermine the economy.

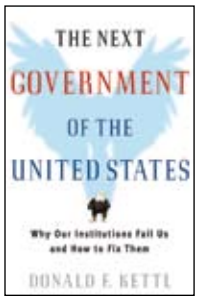
How can President Obama lead the search for a global plan without leaving Main Street Americans feeling neglected? And how can he cobble together a plan to stimulate the economy without turning the federal budget into an ATM on steroids? It cost almost $150 billion in tax breaks to ram the $700 billion bailout through Congress. With dollars spilling dizzily out of the treasury, what's a few billion more here or there for everyone's favorite pork? We need a big stimulus plan and we need it fast, but the new president will need to do it in a way that doesn't push the government even deeper into long-term creditcardaholism.

Perhaps most importantly, President Obama promised vision and collaboration, at home and abroad. But crisis management is hard to steer through partnership. How can he allow the important players to share in decisions while maintaining a firm hand on the steering wheel?

The new president never got a chance for a honeymoon. He had to manage the transition without taking a breather or rocking the Bush administration's boat too much. He had to push the campaign promises aside without upsetting his supporters. And now he faces the most fundamental redefinition of government's role in more than 75 years.

Deep down, most Americans knew that neither candidate was going to be able to follow through on all the promises being made. We were really trying on each candidate's style to see how confident we felt about letting him steer a course into a storm of fierce new problems where no one really understands the questions, let alone the answers. We're about to find out whether President Obama can hold a true and steady course in the economic storm that has overtaken us.

Donald F. Kettl is the Robert A. Fox Leadership Professor of Political Science.



It's Just Rocket Science
When they launch rockets, Kettl observes, rocket scientists "figure out what they're trying to accomplish, pull together the people needed to do the job, focus them on the objective, give them what they need, and hold them accountable for the results. And that, it turns out, is the key to effective government."

History Rising from the Ruins

A doctoral student in Art and Archaeology of the Mediterranean World, Stephan Zink has spent the past four summers conducting fieldwork on-site at what remains of the Temple of Apollo on Rome's Palatine Hill. Built by Augustus and dedicated in 28 B.C., it is considered by many to be the most personal building project of the Roman Empire's first emperor.

What would become Zink's dissertation topic—an architectural case study of the temple, including a reconstruction of its ground plan and elevation—began with a request from his advisor. Lothar Haselberger, the Morris Russell and Josephine Chidsey Williams Professor of Roman Architecture, asked Zink to measure a single column-drum fragment to resolve contradictory documentation dating from the 1950s and '60s. "Once I was in the field," Zink explains, "things developed their own dynamic. I realized that the temple remains showed much more potential than anyone had thought."

He studied and documented in architectural-scale drawings both the temple's surviving marble fragments and its foundations. Using key measurements he was then able to create a 3-D model. According to Zink, his reconstruction will enable scholars for the first time to conclusively classify the temple's design.

"In comparison with Augustus' other temples in Rome, this building follows a kind of historicizing design," Zink explains. "It was meant to be an ostentatious recourse to earlier architectural traditions."

Having completed documenting the temple's surviving marble fragments, Zink has secured permission to produce a plan of the entire ruin, which he expects will generate new information on the temple's interior organization.

To view a slide-show essay on Zink's research, visit www.sas.upenn.edu/zink.

—BDS