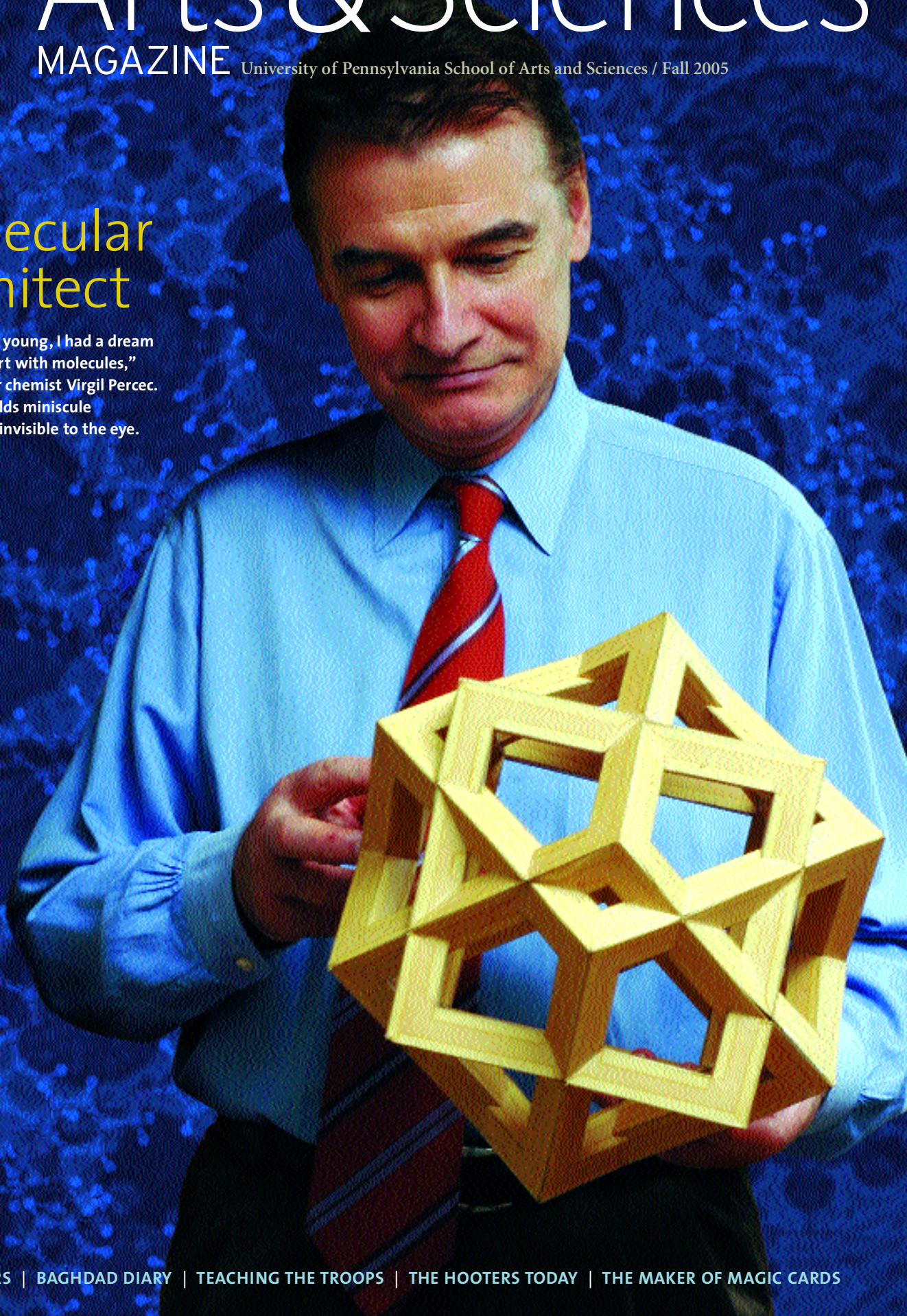


Molecular Architect

“When I was young, I had a dream of creating art with molecules,” says polymer chemist Virgil Percec. Today he builds miniscule monuments invisible to the eye.




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Penn Arts & Sciences

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Letters

Penn Arts & Sciences welcomes letters and reserves the right to edit. Write to us at 3440 Market Street, Suite 300, Philadelphia, PA 19104-3325 or e-mail at pennsas@sas.upenn.edu.

What next?

As a retired faculty member, I was dumbfounded by Dean DeTurck's statement in "Down with Fractions" that "in this digital age, [fractions] are as obsolete as Roman numerals." It reminded me of efforts by one of the state legislators a few decades ago to change the value of pi to 3 because 3.14 may be too complicated. Learning fractions in elementary school helps develop the brain just as crawling helps develop muscles for walking. I have worked with computers since the 1950s. As a consultant for RCA's Advanced Technology Group, I found that some programmers understood how to program, but they did not have a sufficient understanding of mathematics to program equations correctly. In the 1970s, I disallowed the use of calculators during exams after several students, in calculating the speed of electrons in a conductor, produced answers greater than the speed of light. Too often, computers and calculators lead to reliance on the machines rather than proper education, which develops the ability to think. Any nitwit can punch keys on the keyboard but not everyone can tell whether the results are correct or even reasonable! What next? Down with spelling because we have spell-checkers?

*Leon W. Zelby, EE'56, Gr'61
Norman, OK*

Hit piece

I read with interest Joseph McLaughlin's cover story, "Still a Lot More to Do." After summarizing Mary Frances Berry's career in the civil rights movement, the biography dissolves into a hit piece on the George W. Bush administration. There are five paragraphs of negative comments and outright attacks against the current government and its civil rights record. Where is the "fair and balanced" in this journalism?

McLaughlin cites Berry's charge that one of the "contemporary threats to civil rights" is the president's appointment of minorities, such as Secretary of State Rice and Attorney General Gonzalez. What a threat! He quotes Berry as saying that appointments of minorities to positions of power are applauded by minorities "when it happens for the first time." Nothing was then added about minority appointments by the president in his second term, which followed the appointments in his first. Thus Dr. Rice's appointment was not "the first time" a minority served as secretary of state.

McLaughlin's attack gained momentum when he stated that "Bush refuses to address the annual convention of the NAACP." How many conventions did President Bush not attend? One is the answer, but the not-so-clever action verb "refuses" makes it sound like a string of them. Bush was so badly treated at an earlier NAACP appearance that he understandably declined to expose himself again.

The president's acceptance of the Supreme Court's ruling on affirmative action is not treason. It is the same position other conservative leaders have taken, arguing that special preferences diminish the self-help efforts of minorities and encourage a feeling of victimhood and entitlement.



The only political comment that is accurate in the whole piece is that "minorities' ... longtime loyalty to the Democrats has not been rewarded." Comparing the Cabinet-level appointments of the Clinton and George W. Bush administrations leaves no other conclusion.

I trust that in your next issue there will be a piece favorable to the Bush administration's position on civil rights or some other issue of importance to provide a semblance of balance.

*Wesley B. Truitt, C'61
Marina del Rey, CA*

Where does that leave us?

I just read "Still a Lot More to Do" regarding Mary Frances Berry. While she is to be admired and given the greatest respect for her years of work, does anyone see the irony in the first paragraph, wherein she is listed as an Independent and also quoted as saying, "If the people on the right and people on the far left both have bad things to say about me, then I must be doing alright." Is the balance in the last statement between those on the right and those on the far left, and where does that leave us?

*Michael Koehn, Gr'79
Palos Verdes Estates, CA*



James B. Abbott

Planning for Eminence in the Arts and Sciences

BY DEAN REBECCA W. BUSHNELL

DEAN'S COLUMN

We needed to build on the School's momentum and shape a future that would bring it to new heights of eminence.

In recent years, the School of Arts and Sciences has gained a reputation for excellence unprecedented in its history. This reputation is grounded in our superb faculty and students, who are intellectually ambitious, inventive and versatile. Our faculty move nimbly across disciplinary boundaries to address emerging questions and ideas. They are known for their eagerness to innovate in teaching and research, and to engage with local and global communities. The School attracts exceptional students who thrive on the challenges and opportunities they find on campus, in Philadelphia and around the world.

Our current strength derives from a strategic plan devised in 1999, under the leadership of my predecessor, Sam Preston. When I became dean, I quickly realized it was time for a new plan. The University had a new president with fresh ideas, and the School would encounter new opportunities to prosper in the coming decade. We needed to build on the School's momentum and shape a future that would bring it to new heights of eminence.

In forging a new strategic plan, I asked faculty, students, overseers and alumni to step back and think big. I also met with deans from Penn's other schools. The result is a set of goals and priorities that will guide our decision making over the next five years. Here are some highlights.

For the School to prosper, we must increase faculty size to expand into new areas of knowledge, to innovate in education and to achieve critical mass in key disciplines. To recruit and retain top scholars, we must also attend to the time, funding and facilities that support teaching and research. Most critically, the School will pursue a long-range facilities plan that includes new construction projects, such as phase II of the Life Sciences Building, as well as extensive renovation of classrooms and laboratories.

The School is home to almost half of Penn's students and plays a central role in the education of nearly all undergraduates and many graduate and professional students. A more flexible general education curriculum, approved by the faculty this past spring, will be implemented for the Class of 2010. The new undergraduate curriculum emphasizes interdisciplinary learning and global awareness, and it will be sustained by improved mentoring and advising. The School's Ph.D. programs, which are essential to Penn's standing as a world-class research university, are small and highly selective. To enhance their quality, we will hold individual graduate groups accountable for performance when allocating resources, provide incentives for graduate programs to obtain external funding, and simplify the tuition structure and

course requirements. In response to evolving needs of lifelong learners, the College of General Studies will review its bachelor's and master's degree programs to ensure continuing excellence and to explore promising new directions.

We also believe a Penn education should be accessible to the very best students, regardless of ability to pay. The School will make fundraising for endowed undergraduate scholarships and the identification of new sources for graduate fellowships a high priority.

All these efforts will be coordinated with targeted investments in five cross-school, multidisciplinary initiatives that engage numerous University partners in a common cause. We believe that many of the world's most pressing problems and its most compelling questions demand multidisciplinary responses. These initiatives – genetics, neuroscience and behavior, nanoscience, cross-cultural contacts, social dimensions of health, and democracy and constitutionalism – will build on existing strengths at Penn and engage faculty and students in vital global issues.

It is an ambitious plan, but I am confident that achieving its goals will secure for the School a position of even greater prominence in the world and enhance our ability to use the knowledge we create for the greater good. ■

THE HOOTERS ON STARDOM AND STAYING POWER

Rock 'n' Roll & a Comfy House

Eric Bazilian, C'75, is hiking through a national park somewhere in northern Sweden. Engulfed by the wilderness, Bazilian and his two youngest children – ages 4 and 6 – are on the lookout for wolverines, bears and all manner of forest creatures. “The countryside here is just amazing,” he says of his wife’s homeland, which the family visits each summer. “I used to have to force myself to come over here, and the carrot was that I could setup in the barn and write music every day.”

Two decades ago, Bazilian and Rob Hyman, C'72, were in the midst of an experience that was equally wild – but nowhere near as serene. With their band, the Hooters, they kicked off Live Aid in Philadelphia on July 13, 1985, before a capacity crowd at JFK Stadium and billions of people watching on TV worldwide. “We were sort of like deer in the headlights,” Bazilian says. “We were all concentrating so hard that it took a while to realize what we were experiencing.”

It was a high-water mark for the two friends, who met in an electronic music class at Penn and later achieved all the trappings of rock stardom – iconic singles like “And We Danced,” music awards and concerts with the likes of U2 and Bruce Springsteen. “If we weren’t writing, we were recording; if we weren’t recording, we were on tour,” Hyman says. “It was a time in music when worlds were colliding. MTV was new and amazing, and everyone was tuning into that nonstop.”

Unlike most of their contemporaries, however, the Hooters survived the ‘80s with their music intact. Apart from playing with the band, Hyman and Bazilian are known around the industry as first-rate songwriters and performers, having worked with such artists as Mick Jagger, Willie Nelson and Ricky Martin. Most notably, Hyman earned a Grammy nomination for co-authoring Cyndi Lauper’s 1984 hit “Time After Time,” while Bazilian received the same recognition after he penned Joan Osborne’s 1995 breakout single “One of Us.”

Bazilian recalls seeing Osborne play his composition to a packed house in Philadelphia shortly after its release. “I started feeling some pangs of jealousy,” he admits.



Eric Bazilian and Rob Hyman

“Then I realized that after the show, she would get back on the bus and drive for six hours and I would go back to my comfy bed and house with a studio in the back.”

After lying fallow for the last half of the 1990s, the Hooters were invited to perform at a 2001 concert in Philadelphia. The show led to a well-attended European tour in 2003 that has continued over the past three summers. When the multinational Live 8 concerts woke the echoes of Live Aid, the Hooters watched parts of the broadcast from a hotel in Germany while prepping for the tour’s closing night.

“We’re all very different people, but when we play live, something happens. It’s that simple,” Hyman says. “We’ve accumulated a lot of riffs over the years, and they’re exploding on stage.” He adds that their recent performances feature eight to 10 new compositions, some of which are planned for an upcoming album. “It’s a privilege to live a semi-normal life and for one or two months out of the year, get on a plane and be a rock star,” Bazilian says. “It’s still an incredible thrill to write a song and the next day go play it with the band.” ■

—JOSEPH MCLAUGHLIN

“IT’S A PRIVILEGE TO LIVE A SEMI-NORMAL LIFE AND FOR ONE OR TWO MONTHS OUT OF THE YEAR, GET ON A PLANE AND BE A ROCK STAR.”

Interns Invade Philly

When the summer research internship program began in 2004, the plan was to expose College students to the ways and means of research by partnering with campus cultural institutions. The program was so successful that it was expanded in its second year to include premier artistic and historical organizations across Philadelphia.

Several interns were selected to build their research skills at the Philadelphia Museum of Art, National Constitution Center and Library Company of Philadelphia. As a research intern in the PMA's education department, senior **Alexis Orenstein** was responsible for creating and augmenting object files that chronicle the history of some of the museum's most revered pieces. Orenstein says the experience turned her into a detective of sorts, leading her to art libraries and archives all over the city in her search for details about each piece of art.

"I took an art appreciation class at Penn before my internship," Orenstein says. "The research I've done here has allowed me to take the tools I learned in class and apply them to some of the world's greatest pieces of art." In addition, she learned about all aspects of the museum's operation through explanatory seminars and was called on to deliver a spotlight talk about a piece from the museum's collection.



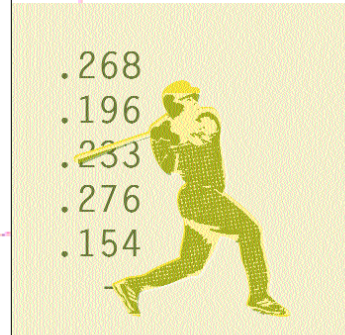
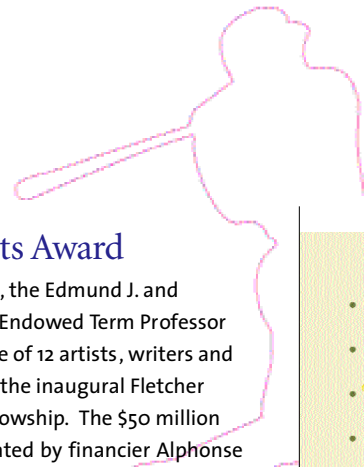
Alexis Orenstein

Civil Rights Award

Thomas Sugrue, the Edmund J. and Louise W. Kahn Endowed Term Professor of History, is one of 12 artists, writers and scholars to win the inaugural Fletcher Foundation Fellowship. The \$50 million foundation, created by financier Alphonse Fletcher Jr. advances the cause of racial equality as outlined in the U.S. Supreme Court's 1954 *Brown v. Board of Education* decision. The \$50,000 award fetes those whose work improves race relations and illuminates civil rights issues.

Other honorees include Brandeis professor Anita Hill, who is known for accusing then-Supreme Court nominee Clarence Thomas of sexual harassment, and Kathleen Cleaver, a former Black Panther Party activist. "I was blown away when I saw the list of recipients," Sugrue says. "It's a who's who of major figures in the world of race and the arts, civil rights and black activism. I was very happy to be in their company."

With the stipend from his award, Sugrue will finish writing *Sweet Land of Liberty: The Unfinished Struggle for Racial Equality in the North*, which is scheduled for publication by Random House next year. "Most of our scholarship in civil rights focuses on the South – the classic period between the Brown decision and the assassination of Martin Luther King Jr. in 1968," Sugrue says. "The story of civil rights in the North has been told in little bits and pieces – like the struggle over busing in Boston – but no one has really put it all together."



Elizabeth Trost

Swing, Batter!

Baseball fans have long admired players who can produce a hit when their teams need it most and are quick to scorn those who fail. But do some players really rise to the occasion as much as the fans like to believe, while others fall short? As it turns out, the answer is yes. That's according to a study by senior **Elan Fuld**, who took it upon himself to determine whether such lofty praise – or universal derision – is truly warranted.

Fuld's calculations provide statistical evidence that players such as Eddie Murray, Frank Duffy and Luis Gomez were all clutch hitters. Fuld, a baseball aficionado as well as a dual major in math and economics, devised a method of analyzing 1,075 Major League players from 1974 through 1992. He modeled players' at-bat outcomes using the importance of the game situation to make his determination.

"Once situational importance rose to ... a certain level, the player would start to think this is very important and do something that makes him hit better, if he's clutch, or panic and do something that makes him hit worse, if he's a choke hitter," Fuld says.

He was surprised to find that some players who had reputations as choke artists were actually quite clutch. Bill Buckner, the ill-fated Boston Red Sox first baseman who famously missed a routine ground ball in the 1986 World Series, was statistically proven to be an above-average clutch hitter.

Advising.com

College Dean **Dennis DeTurck** and a team of four advising experts gathered in a Towne Building classroom on June 29 to discuss freshman year at Penn with incoming first-year students. But instead of seeing fresh young faces, DeTurck and company were met with a makeshift television studio and computer equipment. That's because the students-to-be were home – sitting in front of their computers – waiting to begin the College's first live advising webcast. Over the next hour or so, the Penn experts fielded such common questions as "How does advance registration work?" and "How can I be sure to get the classes I want?" posed to them from all over the world.

"Because you are now or will be 18, your grades are sent to you, and who else you let see them is entirely up to you," DeTurck said when asked whether parents received student grade reports. "People at Penn will not reveal your grades to your parents unless you give us permission."

The three advising webcasts held this past summer occurred at three different times of day to accommodate a global audience. DeTurck began the first webcast at 9 p.m. and started the final one at 8 a.m. Although their purpose was to help incoming freshmen arrange their schedules, the conversations were wide ranging. Much of the information covered in the webcasts remains useful even though classes already have begun. You can watch Dean DeTurck lead the sessions by going to <http://www.college.upenn.edu> and click on the "webcast archive" link.



Ray Eames with prototype of *The Toy*

Whimsical Works

A little-known legacy of furniture manufacturers Charles and Ray Eames found a home this past summer at the Arthur Ross Gallery. Staged by students in the Halpern-Rogath Curatorial Seminar – part of the Master of Liberal Arts program in the College of General Studies – the exhibition featured toys, children's furniture and fanciful films by the husband-and-wife design team.

"Whimsical Works: The Playful Designs of Charles and Ray Eames" focused on the couple's lighthearted approach to serious things and earnest take on playful things. "Toys are not really as innocent as they look," Charles Eames once said. "Toys and games are the preludes to serious ideas."

On display were two structural building toys, several examples of plywood furniture and three short films: "Tops," "Toccata for Toy Trains" and "Kaleidoscope Jazz Chair." In addition, the presentation featured photographs taken by the office of Charles Eames that chronicled the creation of these objects.

Charles and Ray Eames are mostly known for introducing molded-plywood and plastic furniture to America. They are credited with helping to modernize the country after World War II by partnering with the federal government and top businesses. Charles became one of the country's leading cultural diplomats, helping to shape arts-related programs through his service on various councils.

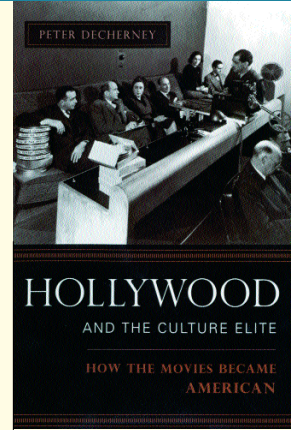
BLAST Off

The view through even the best telescopes on Earth is obscured by the atmosphere, and the cost of putting one in orbit is, shall we say, astronomical. How then, can scientists get a better peek at the stars for bargain-basement prices? Easy. Suspend a Chevy-sized instrument from a 33-story balloon, and float it up into the very edge of space. That's what **Mark Devlin** and an international team of scientists did in June with the Balloon-borne Large Aperture Sub-millimeter Telescope (BLAST) that they created. "Balloon-based astronomy offers many of the perks of space-based telescopes at a fraction of the cost," says Devlin, the Class of 1965 Endowed Term Associate Professor of Physics and Astronomy,

who heads the project. BLAST's journey carried it from the launch site in Kiruna, Sweden, to Inuvik in the north Canadian tundra. During the five-day flight, 260 detectors harvested photons from far-off regions of the universe. The data "will address some of the most important cosmological and galactic questions regarding the formation and evolution of stars, galaxies and clusters," Devlin reports. A second and longer data-gathering mission is planned for the end of 2006. "It's relatively uncharted territory," the cosmologist notes. "Not only are we collecting some unique and interesting information about the universe, but we're also pioneering technologies that will pave the way for other planned balloon projects."



Mark Devlin



East Meets West

Tabloids keep us up to date on the frolics of glamorous stars and the backstabbing of ruthless powerbrokers in Tinseltown. In his latest book, *Hollywood and the Culture Elite: How Movies Became American*, **Peter Decherney** examines the flipside of pop culture and reveals surprising connections between Hollywood bigwigs and the stewards of high culture at such places as Harvard, Columbia, and the Museum of Modern Art. Decherney, an assistant professor of cinema studies and English, writes that "Film didn't become art until Hollywood moguls decided it was good business for film to become art and the leaders of American cultural institutions found it useful – politically useful – to embrace and promote Hollywood film." His book looks at the mutual embrace of highbrow institutions on the East Coast and a money-making pop-culture enterprise on the West Coast during the golden era of Hollywood's studio system. Both centers of influence wanted to reach a mass audience that spanned the coasts. East reached out to West to "maintain their hold on American art, education, and the idea of American identity itself." The studios met East-Coast establishments halfway to solidify their hold on popular culture and to benefit financially. That collaboration with museums, universities and government, writes Decherney, "redefined Hollywood as an ideal American industry, the perfect marriage of art and commerce."

Gaelen Mandlen

Death Delayed

“Why do I overlive?” Adam cries out in *Paradise Lost*. Author **Emily Wilson**, in *Mocked with Death: Tragic Overliving from Sophocles to Milton*, uses Adam’s dark lament as the basis for a literary analysis of living too long. Wilson, an assistant professor of classical studies, probes the fate of living on when death seems preferable in works by Milton and four of his literary predecessors: Sophocles, Euripides, Seneca and Shakespeare. Each writer composed works in which the main character undergoes unbearable suffering or loss and calls out for death but goes on living. The tragic tradition, she argues, sometimes finds its energy in a character’s living on rather than in dying when readers would expect. “Why am I mocked with death, and lengthened out/To deathless pain?” Milton’s Adam moaned. Certainly in our time, we sometimes hear echoes of Adam’s anguished cry in patients hooked up to life support or from those enjoying the mixed blessing of a longer life. “Tragedies of overliving disturb the ... reader,” Wilson writes, “by reminding us that life may feel too long and endings may seem to have come too late.”



Emily Wilson

Marco Roth



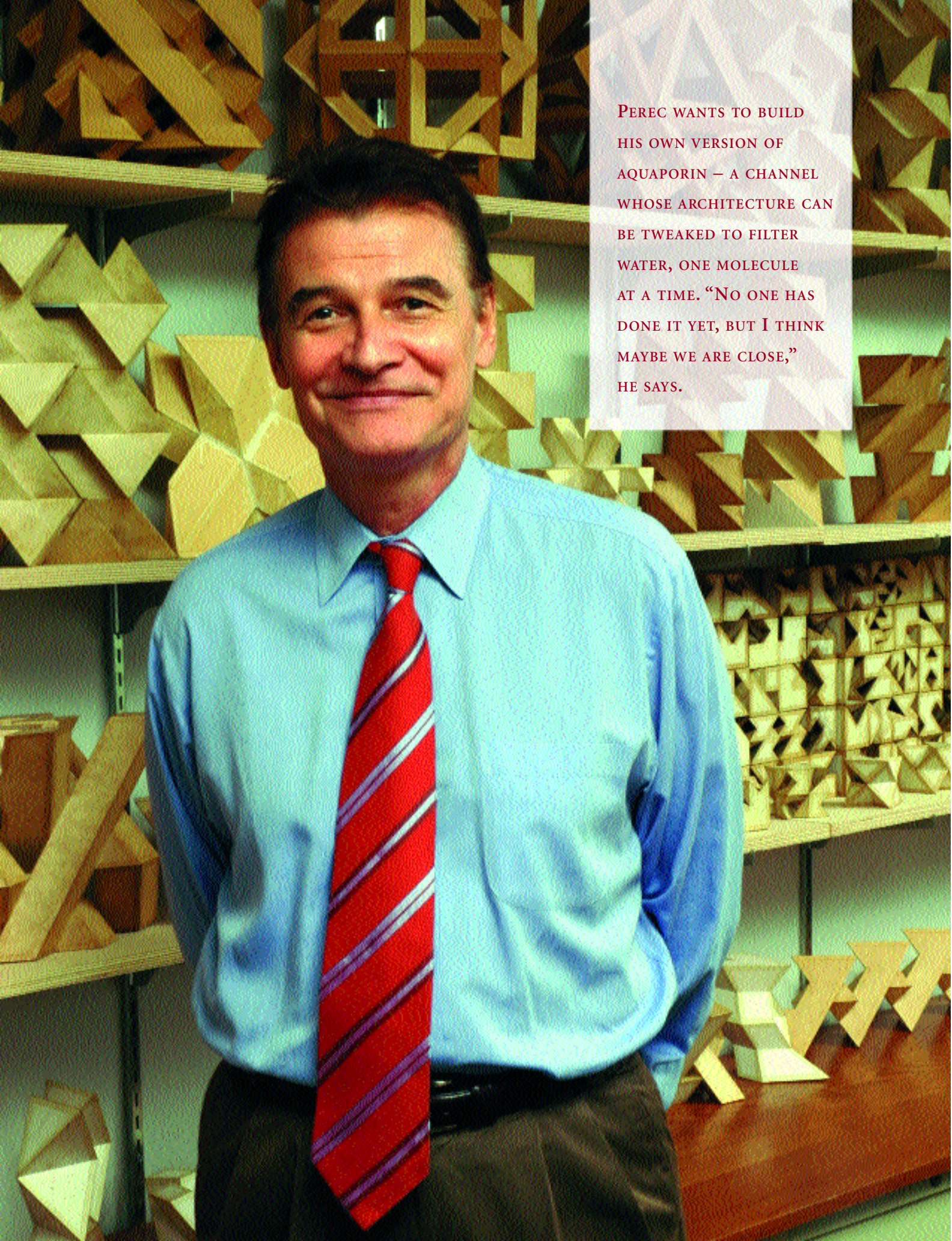
Andrew Taylor/Dreamstime.com

Continental Divide

When surveying the national landscape, Penn sociologist **Jerry Jacobs** and NYU professor Kathleen Gerson point to the “dramatic changes in the ways Americans organize their work and family lives.” In their study of family time pressures, *The Time Divide: Work, Family, and Gender Inequality*, Jacobs and Gerson argue that society’s “dilemmas and conflicts” come from the diversity of families in the workforce – from two wage earners to single mothers to workers without kids. Their research punctures the prevailing myth that Americans are working longer hours, suggesting that the time squeeze is far more nuanced. “Understanding the average is important,” explains Jacobs, the Merriam Term Professor in Sociology, “but there are more exceptions to the rule than ever.” If you look at working families, instead of individual workers, the coauthors say, “time divides” – between the overworked and the underemployed, between women and men, between parents and non-parents – are apparent. “Many feel tremendous time pressures due to demanding jobs, especially in dual-career families,” explains Jacobs, “but others are looking for more work. Managers and professionals work very long weeks, but the work week among those with less education has not grown over the last 30 years.” The book makes many recommendations, and the authors’ insights should find their way to the conference rooms of policy-makers.

Talk It Out

New research has shown that cognitive therapy, which teaches people to understand and change harmful thoughts, works as well as changing people’s body chemistry with pills. A recent study by psychology professor **Robert DeRubeis** and a colleague at Vanderbilt challenges American Psychiatric Association guidelines that tout medications as the best treatment for depressed patients. Published in the *Archives of General Psychiatry*, the study is the largest yet to determine the relative merits of the two approaches. The experiment divided 240 depressed patients into three groups, treating one with antidepressants and another with cognitive therapy. The third group was given a placebo. After 16 weeks, the results for those receiving talk therapy and those on drugs were statistically identical. The researchers also found that subjects who were given drugs were more likely to relapse into depression, suggesting that cognitive therapy continued working after treatment ended. “We believe that cognitive therapy might have more lasting effects because it equips patients with the tools they need to manage their problems and emotions,” says DeRubeis, who is also associate dean for the social sciences in SAS.

A man with dark hair, wearing a light blue dress shirt and a red tie with diagonal stripes, stands in a room. The walls are covered with various wooden geometric shapes, including triangles and squares, some of which are mounted on shelves. The man is smiling slightly and looking towards the camera. The lighting is warm and focused on him.

PEREC WANTS TO BUILD HIS OWN VERSION OF AQUAPORIN – A CHANNEL WHOSE ARCHITECTURE CAN BE TWEAKED TO FILTER WATER, ONE MOLECULE AT A TIME. “NO ONE HAS DONE IT YET, BUT I THINK MAYBE WE ARE CLOSE,” HE SAYS.

The Molecular Architect

CHEMIST MAKES MONUMENTAL STRUCTURES OUT OF MOLECULES

BY DANA BAUER

Virgil Percec is one of the world's greatest polymer chemists, but this morning, over dark and smoky espresso, he's telling me about a time when he wasn't.

"You'll like this," he says. In 1982, when he was a new assistant professor at Case Western Reserve University, the physicist Aaron Klug came to campus to give a lecture. "I was invited to have dinner with Klug that evening. The dinner was to be at the most expensive French restaurant in town, so I felt obliged to go to the lecture."

The name Klug doesn't register, so I lean in to catch the details of Percec's story. He speaks softly, with a thick accent from his native Romania.

"I thought the lecture was very boring," Percec continues. "He was giving it to the physics community, and it didn't seem connected to what I was doing. I was very naive."

A few days later, Percec was reading *The New York Times* on a plane. On the front page was a picture of Klug. "I thought he must have done something wrong. You don't get on the front page of the paper in this country unless you do something wrong. Well, Aaron Klug had received the Nobel Prize. And the shock was not that he had received the Nobel Prize, but that he received it for chemistry as a physicist. So I

figured he must have said something important in that lecture."

Klug's message was deceptively simple: "Structure determines function." It was the lesson passed down by the scientific generation before him, by DNA mavericks like Watson and Crick. By the time Klug got his Ph.D., says Percec, "he had decided that DNA was over, so he moved on to the next challenge," understanding the interactions of really big molecules and proteins – work that earned him the Nobel. And more than 20 years later, Percec, now the P. Roy Vagelos Professor in Chemistry at Penn, is applying Klug's dictum to a new and decidedly modern pursuit: *building* designer molecules that work like the real thing.

"Now here's an interesting problem," says Percec, showing me a computer image of a tangled structure nicknamed "the hourglass." Within its curvy silhouette, red spheres parade single file through a hollow column of coiled and colorful ribbons. We're looking at a model of aquaporin, a protein channel that transports pure water into cells at a rate of a billion molecules a second. "It's an amazing structure," he says. "It makes manmade methods of water purification look like something out of the Stone Age."

Peter Agre of Johns Hopkins University won the Nobel Prize for

his 1991 discovery of aquaporin. Years later, researchers at the Berkeley Lab uncovered its structure. Percec wants to go a step further and build his own version of aquaporin – a channel whose architecture can be tweaked to yield a host of possible functions that include filtering water, one molecule at a time.

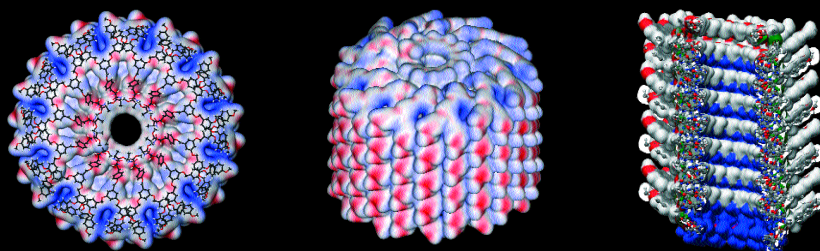
"No one has done it yet, but I think maybe we are close," he says, a smile playing on his lips.

Laying the foundation

"I didn't intend to become a chemist," Percec tells me. We're sitting in his fourth floor office in the Vagelos Labs, surrounded by stacks of papers and books. On the wall above his desk hangs a bright orange, yellow and red painting that, at first glance, looks like a bouquet of fiery flowers. Actually, says Percec, it's a spherical molecule he built in the lab. The painting was an award from the Royal Netherlands Chemical Society.

"I loved art when I was a boy," he continues. His father was a painter and musician who encouraged his son in both areas. "Although I became addicted to art, I did not want to be second to my father, and therefore I decided to study architecture," he told *Chemical and Engineering News* in 2004. But two organic chemistry courses during his last semester of high school

PERCEC'S PORE



Top view showing the 12 dendritic dipeptides that form the opening of the pore

Side view of the protein pore assembled from dendritic dipeptides

Cross section showing the inner part of the pore constructed from layers of dipeptides (blue and white)

Dr. Percec

changed everything, and he decided to switch to chemistry.

That decision made his parents very unhappy. “The Romanian system, you see, was more complicated than the American system. Usually it’s quite a dangerous experiment to change direction like that.” Because university programs were limited and specialized, Percec risked not getting a position in any program. That was the last thing his parents wanted. He was the first in the family with a chance to go to college. His grandfather had been a teacher and politician, “but when the Communists took over, he was thrown into prison and his seven kids were kicked out of school.”

Percec’s experiment paid off. In 1976, he earned a Ph.D. at the Institute of Macromolecular Chemistry in Jassy, Romania, specializing in polymer chemistry, the science of large molecules made of simple repeating units. As a young researcher at the institute, he got off to an auspicious start. His work on the synthesis and structural analysis of a certain type of polymer is still used by scientists today as a blueprint for the design of large helical-shaped molecules.

But one day in the late 1970s, Percec returned from an international conference to discover that a KGB officer had reported him to the government. “I don’t remember why exactly. I probably said something about the freedom in the West compared to the East,” he speculates. As a consequence, his traveling privileges were curtailed, and he had to turn down all invitations to do research and give lectures around the world. “For a combination of reasons,” he says, including his family history, Percec imagined a limited future in his homeland.

Several years later, the Romanian government granted permission to travel to conferences in Russia and Italy. However, his requests for a passport to attend a meeting of the International Union of Pure and Applied Chemistry in France were repeatedly denied. “The government probably thought, ‘this guy Percec cannot be trusted,’” he surmises. Finally, a colleague who was close to the entourage of Nicolae Ceausescu, the Romanian president, intervened and helped him get a passport. Percec decided that if he got out of the country, he would

not return. “That night I rode the train from Bucharest. You can never be sure if they’ll let you across the border. Even with a passport, they can turn you away.”

He made it to the conference, where he told colleagues he was defecting. The next step was to get his wife, who is also a chemist, and young daughter out of Romania. Dozens of prominent scientists, including Nobel laureate Paul Flory, wrote letters to the Romanian embassy in Washington, D.C., on Percec’s behalf. Only when the scientific community threatened to boycott a major conference in Bucharest and embarrass Elena Ceausescu, the president’s wife and host of the conference, were Percec’s wife and daughter allowed to join him.

With his family by his side and the constraints of the Romanian government behind him, Percec’s scientific career took off. By 1986, he was a full professor at Case Western, and in 1999, he joined the Penn faculty. The move seems to have accelerated his already distinguished career. An ambitious and prolific scientist, Percec has more than 500 papers, 32 patents and 700 invited lectures to his name. In the last few years, he has won several major awards, including the 2004 American Chemical Society Award for Polymer Chemistry. He is widely recognized as one of the most creative and innovative polymer chemists working today.

Building blocks

Creating a synthetic version of a protein channel isn’t an easy task, explains Percec, pointing to the image aquaporin on his 12-inch Macintosh laptop. The pleasing and colorful picture gives no hint of the multi-leveled, step-by-step building process.

“Mother Nature has spent billions of years working this out. We, most likely, will not be able to understand it in less time. So, therefore, am I going to give up? Say that it is not possible because I won’t be around for billions of years?”

Instead, he and his research team have developed techniques in the lab that mimic what happens in nature. They start by choosing chemical building blocks that come together much like the components of proteins do.

“Proteins have multiple levels of structure,” Percec explains. The first level is a polypeptide chain, a string of tightly bonded amino acids spaced evenly along a chemical backbone. The second level of structure is caused by “local” chemical attractions, the twisting of the polypeptide chain along its backbone. The next level is the overall three-dimensional shape of the molecule – the way it bunches and turns in on itself so that the “water-hating” parts of the molecule are grouped together on the inside and the “water-loving” parts are on the outside. Sometimes several polypeptide chains come together to form an even larger structure. It is this final three-dimensional shape that gives the protein its biological function.

“The primary structure is the driving force for the higher-level structures,” Percec says. The chemistry of the initial polypeptide chain – the type of amino acids and side chains, its size, whether it is “right-handed or left-handed” – determines how the structure will “self-assemble” into the desired three-dimensional shape.

In the lab, the process is similar. Andres Dulcey, one of Percec’s research assistants, explains it this way: “We choose the bricks, but we don’t build the house. The house

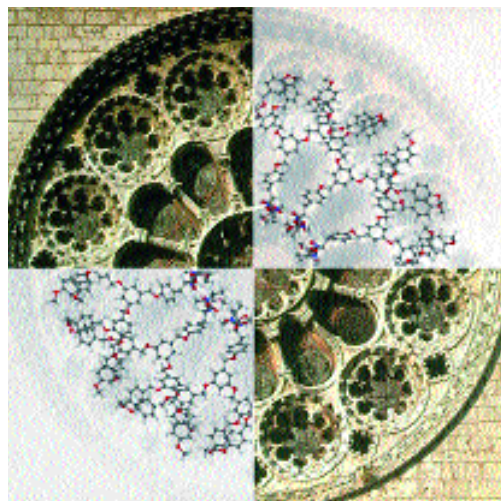
builds itself depending on the properties of the bricks.”

Percec’s choice of “brick” makes his work unique. He and his team are using dendritic peptides, tree-like polymers that can be altered in countless ways. If the research group is trying to build a sphere (like the one in the painting in Percec’s office), they start with cone-shaped dendritic peptides that cluster together with the tapered ends touching at a single point. Building blocks shaped like pie slices come together to form disks that can stack into columns. “Small changes in the dendritic peptides can give you big changes in structure,” Percec explains.

Molecular cathedrals

Last summer, Percec reported in *Nature* the creation of a helical structure that looks and works like protein pores in a cell – the holes through which “all the materials that make life possible” pass into and out of the micro-organism. Percec’s creation is the first successful attempt at a synthetic pore that is stable, functional and flexible. He and his team are now modifying the size and shape of the minuscule structure to make it selective like aquaporin, allowing only certain molecules to pass through it. *Structure determines function.*

Percec likes to compare his protein pore mimic to the Rose Window on the west facade of Chartres Cathedral in France. He shows me a computer image of the pore superimposed on an image of the window. The resemblance is uncanny. The dendritic peptides have branching tendrils that radiate from a central core, and the cathedral window has a series of tear-shaped stained-glass panels that radiate from a central window.



Architectural Twins: A layer of dendritic dipeptides from Percec’s pore over the Rose Window from the west facade of Chartres Cathedral in France

TWEAKING THOSE ARCHITECTURAL MOTIFS TO YIELD NEW STRUCTURES WITH NEW PROPERTIES IS PART OF THE ART AND SCIENCE OF PERCEC’S WORK.

“What do you think? Twins, maybe?”

He’s being playful, of course, but the comparison gets at one of the fundamental aspects of his work: developing architectural motifs – wedges and cones, for example – that assemble into structures that are “beautiful” in both a functional and aesthetic sense.

Tweaking those architectural motifs to yield new structures with new properties is part of the art and science of Percec’s work. That’s where the creativity comes in.

“When I was young, I had a dream of creating art with molecules,” he says. “I still have that dream.” ■

Dana Bauer is a freelance science writer in Philadelphia.

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BY PETER NICHOLS

Penn anthropologist and literary stylist Loren Eiseley, Gr'37, once struggled with how he might answer a student in a science course who asked, "Where did I come from?" The question has a Baltimore Catechism ring to it, but Eiseley's response is, if not pure science, then science that is poetically rendered. " 'Son,' you say floundering ... 'There was an odd fish in a swamp and you have his lungs.' Or you say, 'Once there was a reptile whose jaw bones are in your ear.' Or you try again. 'There was an ape and his teeth are in your mouth. Your jaw has shrunk and your skull has risen. You are fish and reptile and a warm-blooded affectionate thing that dies if it has nothing to cling to when it is young. You are all of these things. You are also a rag doll made of patches out of many ages and skins.' "

The intrusion of scientific answers into what were once thought of as religious questions has been troubling to believers, especially to those who read the Genesis story as a science textbook. It took more than 350 years for the Catholic Church to admit the errors of inquisitors who persecuted Galileo when he offered proofs that Earth was not the center of the universe. With the publication of *Origin of Species* (1859), science revealed that we

Science philosopher Michael Weisberg holds a tray full of beetles from the collections of the entomology department at the Academy of Natural Sciences in Philadelphia.

"I think they want to cut

A BIOLOGIST AND A PHILOSOPHER DISSECT A PSEUDOSCIENCE

are, in Eiseley's words, a "rag doll" descended from non-human – even nonliving – ancestors. Molecular biologists have elaborated Darwin's theory of evolution, casting all life as a restless patchwork of genes and proteins, woven and rewoven over vast eons of time into a crazy quilt of furred, finned, winged and leaved species.

"I don't have any trouble with religion being part of how people live their lives," says Penn biologist Paul Sniegowski, "but I do have real problems, as a scientist, with making matters of faith part of how we evaluate scientific findings and theories."

Sniegowski studies genetic mutations that get passed down through generations of laboratory bacteria. Last winter, he and Michael Weisberg, an assistant professor of philosophy, wrote an open letter to the Dover school board, which oversees the education of 3,600 pupils 100 miles west of campus. The board had voted to introduce its students to "intelligent design" in order to assure "a fair and balanced science curriculum." Intelligent design is a critique of evolution that claims life is too complex to be explained by natural causes but requires the guiding hand of an outside intelligence. Not all advocates are biblical literalists. A few are scientists. They don't say whose fingerprints they've found in the natural order, but they contend their position is based on science.

Dover is the nation's first school district to place intelligent design before students as a scientific explanation for the origin of life. The board did not mandate instruction in this new "science," only that teachers should read a statement casting doubt on evolution – "Darwin's Theory ... is not a fact." – while holding up intelligent design as a viable alternative. Students were invited to explore the competing explanation in 60 copies of the intelligent-design manifesto *Of Pandas and People*, which had been given to the school district by an anonymous donor. "With respect to any theory," the statement advised, "students are encouraged to keep an open mind."

Weisberg, who studies theoretical models in evolutionary biology,

deconstructs the Dover statement. The board had singled out evolution, he notes, but it didn't urge the same open mindedness toward any other theory by name. No disclaimer admonished that atomic theory or relativity or plate tectonics might be wrong or controversial, and thus deserving of learners' circumspection. "Clearly, that's not what the board was trying to do with this," he stresses. "They were asking students to do more than keep an open mind – or less."

In a letter signed by 30 members of the biology and philosophy departments, Sniegowski and Weisberg told the Dover board that "the quality of science education in your schools has been seriously compromised." Science, they explained, is "based on ideas well

Photos by Lisa Godfrey

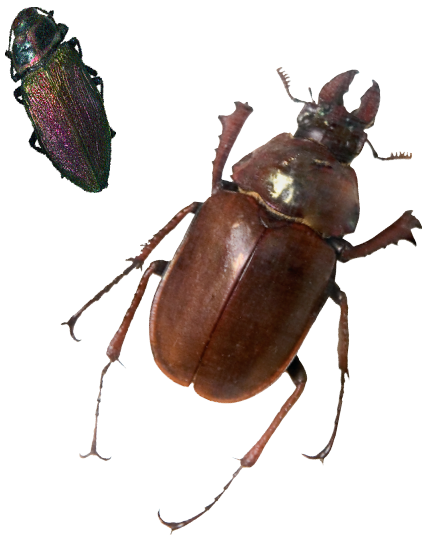
Beetlemania

A cleric once asked J.B.S. Haldane (1892-1964), the British population geneticist, what he might infer about the deity, based on his lifetime of close observation of the natural world. Haldane replied that the creator seemed to have "an inordinate fondness for beetles." Entomologists have described and named more than 350,000 species of coleoptera since 1758. "One of every five species of living organisms – which includes plants, animals, bacteria, fungi and everything else – is a beetle," says Jason Weintraub, entomology collection manager at Philadelphia's Academy of Natural Sciences. Due to their hard exoskeletons, beetles are plentiful in the fossil record too. Paleontologists have tracked their ancestors back as far as 270 million years. ■

Chiasognathus granti, Darwin's stag beetle



our understanding of nature to fit theological preconceptions."



“Evolutionary theory is testable and has been tested and continues to be tested and to produce fruitful new hypotheses that can be tested.”

supported by evidence,” which is solidly the case for evolutionary theory. Intelligent design is “a form of creationism propped up by a biased and selective view of the evidence.”

Sniegowski, not to mention the 11 parents who brought a suit in federal court against the board, contends the Dover policy tries to slip religion into the science curriculum. Promoters of intelligent design, led nationally by the Discovery Institute, a Seattle think tank, studiously avoid references to God. “But if you look below the surface,” Sniegowski maintains, “you can see they are the lineal descendants of the creationists” who lost the anti-evolution court battles of the 1980s.

After their defeat, creationists regrouped and forged a new approach to undercut the teaching of evolution by putting forward intelligent design, “a science

consonant with Christian and theistic convictions.” The quote is from Discovery’s “Wedge Strategy,” a 20-year action plan posted on the Internet in 1999. The Wedge calls for a far-reaching campaign to pry open gaps in court decisions that ruled teaching creationism unconstitutional because it brought God into the classroom. Those verdicts left open the possibility of lesson plans that present other “scientific” origin theories alongside evolution.

Eric Rothschild, L’93, a lawyer with Pepper Hamilton, LLP, and the lead attorney in the case against the Dover board, observes that “intelligent design is a perfect illustration of evolution at work. Creationists were confronted with an inhospitable legal environment, so in order to survive they contrived a new label – intelligent design – for the same basic concept.”

By sidestepping talk about a creator, Rothschild explains, publicists spin intelligent design as a new movement of heretical scientists whose views deserve equal time with Darwinian orthodoxy. It’s about academic freedom. Schools, they insist, should “teach the controversy.” So effective has their publicity been that President Bush spoke on message at a summer roundtable with Texas reporters when he remarked that “both sides should be properly taught ... so people can understand what the debate is about.”

In fact, say the scientist and the philosopher, there is no controversy – the quarrel is being played out almost entirely in sound bites and media hype. At worldwide science conventions and in peer-reviewed journals, scientists have long moved past debate over the soundness of evolutionary theory. “It’s a non-issue,” Weisberg says. “There are scientists who continue to work

out the details of the theory, and there are internal controversies about how certain things should be interpreted, but certainly for the last 75 years there has been full scientific consensus.” Any “gaps” or “problems” in evolutionary theory are the places where investigators pose new questions and carry out research. The curiosity of scientists and their eagerness to be part of that long lineage of question and answer and question again is what keeps scientific inquiry alive.

“Evolutionary theory is testable and has been tested and continues to be tested and to produce fruitful new hypotheses that can be tested,” Weisberg points out. But intelligent design is a strikingly incurious science. Its most compelling finding, that nature gives evidence of an outside designer, has not prompted defenders to pose the next question: Who is the designer? There have been almost no papers in refereed science journals and hardly a hint of a research program at the Discovery Institute. That, declares Weisberg, is what marks it a pseudoscience. Intelligent design is little more than a “series of critiques” that predicts and produces nothing, and ends with an untested – and untestable – hypothesis. These anti-evolutionists, he adds, “spend a lot of time trying to characterize the sort of complexity that they think requires a designer.” The designer might be God; it could be an alien, proponents coyly respond when pushed. And then they cling to that ignorance as a virtue – or a legal expedient.

“I think they want to cut our understanding of nature to fit theological preconceptions,” Sniegowski states. “Dependable knowledge about nature is hard-won and extremely valuable. It’s what lets us run cars and cure diseases. Evolutionary

THE GOD HYPOTHESIS

science is a vital part of that tradition. There really is no reason to change the rules about how we get dependable knowledge and every reason not to.”

The authors of the Wedge Strategy see Darwinism as a secular religion that overthrew traditional forms of Christianity and “infected virtually every area of our culture” with “materialism,” a belief that the world holds nothing more than what can be grasped by the scientific mind. Richard Dawkins, a fellow of the Royal Society and widely read popularizer of evolution, confirmed – and inflamed – that perception when he stated that Charles Darwin “made it possible to be an intellectually satisfied atheist.” If that is true, it is not a scientific finding but a personal discernment that Dawkins came to. Science, Sniegowski and Weisberg are quick to point out, has nothing to say about God, intelligent designer or otherwise.

Scientists of a reductionist stripe may be satisfied that the answers of science are the last word, but many investigators ply its method without professing the belief that science explains everything. For them, it is a tool of discovery that opens up a way of knowing nature rather than a dogma that shuts the door at genes and quarks and stars and fossils. Within the ranks of researchers, many question if there are more things in heaven and earth than are dreamt of in science, and some are even churchgoers. “I can’t reconcile those two things,” Sniegowski comments, “they haven’t been reconciled for 2,000 years, but I would point out that there are lots of things in our lives that we can’t reconcile.” Religion and science, he seems to suggest, are not natural enemies, although they may need to mark territorial boundaries a little

better. “The controversy,” he adds, need not be so polarizing.

Loren Eiseley was a scientist enchanted and awed by the sheer strangeness of evolution. “I too am a many-visaged thing that has climbed upward out of the dark of endless leaf falls and has slunk, furred, through the glitter of blue glacial nights.” Through Darwin’s eyes, he saw that life is a shape-shifter and humanity the latest “bloom on a curious animal extrusion through time.” It is the science-formed poet in Eiseley who speaks here. How natural is “natural”? he wondered. To his way of thinking, Darwin’s theory did not diminish the human race but opened a doorway to what he sometimes called “the unexpected universe.” What is it we are part of? he would ask. It’s not exactly a science question, although it comes from scientific insight, and it may not belong in a biology curriculum.

“Skins may still prickle in a modern classroom,” Eiseley observed, no doubt from personal experience. Those goose bumps once fluffed fur that warmed long-gone ice age ancestors – or bristled their hair in fear, the forebear of awe. “No living thing, not even man, understood upon what journey he had embarked,” Eiseley wrote. But, as he noted in another context, “there’s no use reporting it to the Royal Society.” ■

“There really is no reason to change the rules about how we get dependable knowledge and every reason not to.”



Elizabeth Frost

Paul Sniegowski

When physicist and mathematician Pierre-Simon Laplace published *Mécanique Céleste*, Napoleon asked why there was no mention of God in his five-volume treatise on how the heavens work. After all, the emperor pointed out, the great Isaac Newton, whose theories Laplace had built upon, had found a place for the divinity in his system. The French scientist replied, “I have no need of that hypothesis.”

Almost 100 years before, Newton had given a comprehensive account of terrestrial and celestial motion, which culminated in a theory of universal gravitation. In *Principia*, he laid out, like the innards of a clock, the physical laws that govern the machinery of the universe. Still, some observations were not as predicted, so Newton conjectured that the deity periodically reset the astronomical clock to keep it running on time.

By the early 19th century, the English philosopher William Paley thought he had glimpsed the handiwork of the creator in the intricate order of nature, just as one would infer that a watchmaker had devised a watch one came upon. “[I]ts several parts are framed and put together for a purpose,” he speculated, likewise the highly wrought apparatus of the world implied a world maker.

With the publication of Darwin’s *Origin*, even the cogs and wheels that turn the machinery of life could be bared and understood without invoking the intervention of an intelligent designer. “The old argument of design in nature, as given by Paley,” Darwin wrote, “which formerly seemed to me to be so conclusive, fails, now that the law of natural selection has been discovered.”

“I can tell you, as a working scientist,” biologist Paul Sniegowski says, “that the whole history of science is predicated on not taking it on faith. It’s predicated on putting things to the test. Supernatural explanations of natural phenomena never explained much.” ■

PRESERVING THE MEMORY OF THE ANCIENT WORLD

COLLATERAL



Rose (right) with statuary head of Caesar Augustus from Troy excavation

If Helen of Troy was “the face that launched a thousand ships,” she also launched a comparable number of archaeological digs and academic papers. C. Brian Rose, who joined classical studies in the fall as the James B. Pritchard Professor of Archaeology, is one scholar who’s been on a lifelong odyssey to study the city that Homer immortalized. For 15 years (1987-2002), he was in charge of Greek, Roman and Byzantine excavations there, which explored the Post-Bronze Age settlements overlooked by earlier expeditions more intent on Homer’s Troy. Notable finds include a cache of gold jewelry and the sculpted heads of Roman emperors Hadrian and Augustus. A ditch that might have been a defense against chariots in the settlement associated with the Trojan War was also unearthed. Currently, Rose is in charge of the Granicus River Valley Survey Project, which is mapping the giant mounds of earth that cover ancient Greco-Persian tombs near the Turkish city of Biga.

A new lecture series he developed for the U.S. military, under the auspices of the Archaeological Institute of America, continues his focus on archaeology and war. News reports about the looting of Baghdad museums and Iraqi archaeological sites, including the ancient city of Babylon, led Rose to propose a program for troops heading off to war. “If you look at eBay and do a search on Sumerian cylinder seals, you get a lot of hits,” he says. “Each one of these pieces will end up in a different museum or private collection in a different part of the world. We can never link them to their original contexts and reconstruct the history of their use in ancient society. It essentially amounts to the murder of history.”

The military was interested. Rose offered the first seminar to the Marines at Camp Lejeune in the spring. Not long after, we talked to him about the experience.

Q. *How did you get the idea of an educational program for troops?*

A. Last year at the annual convention of the Archaeological Institute of America, I helped put together a colloquium on the protection of cultural property in Iraq and Afghanistan. The director of the Afghanistan Archaeological Institute came. He said it was too bad we couldn’t make troops more aware of looting and the problems of archaeological conservation. I thought, well, why don’t we do that? Why can’t we simply launch a lecture program under the auspices of the AIA, of which I am vice president, and arrange for lecturers to go to military bases? I contacted Colonel Matthew Bogdanos, who

was instrumental in arranging the repatriation of artifacts stolen from the Baghdad Archaeological Museum. He supported the idea all the way and helped me understand how I could best phrase and organize a proposal that would be sent to General John Abizaid, head of the U.S. Central Command. It took about nine months for the proposal to make its way through the proper channels of the State Department.

Q. *Can you tell me about this cultural heritage and how you talk about it to the troops?*

A. Complex societies in Mesopotamia were developed thousands of years ago, but I start

with the protoliterate period, which began about 3500 B.C. I take them through the monuments and history of Iraq and Afghanistan. I deal with political propaganda, showing them the monuments that the kings of Persia, the rulers of Mesopotamia and Alexander the Great had erected, and then monuments commissioned by Saddam Hussein, who exploited those ancient traditions. I highlight issues with which I think they would be familiar. Almost all have read the Bible, so they know the Tigris and the Euphrates, the Tower of Babel and the names of Nebuchadnezzar and Abraham. I can link all of those into specific areas in the country.



DAMAGE

I emphasize the damage that's been done to these sites over the years. I tell them what archaeologists do and why the sites that they will guard and the artifacts they will see are so essential. Most people don't have a clear understanding of what archaeologists do and how vital each object is in reconstructing the history of ancient societies. In particular, I emphasize smaller things like cylinder seals, and I tie them into my analysis of other evidence to present a reconstruction of who lived in a particular place at a particular time, and how they lived.

I try to emphasize the links between antiquity and the present. I read, for example, the Code of Hammurabi, whom they know because he is now the dominant image on the new currency in Iraq. Hammurabi's inscription records laws concerning religion and military service and relations between the sexes, among other things. That's something that resonates with the troops. My hope is that they will come to understand that this heritage is closer to their own world than they otherwise would have thought.

Q. *Why do you think it's important to create that impression?*

A. I'd like them to feel as much of an affinity for the material as possible. By discussing issues that resonate with them, my hope is that they'll be especially vigilant in safeguarding the archaeological sites and museums. When I speak to the troops, I tell them that the Archaeological Institute of America wants to thank them for patrolling these sites and hindering the looters, who are essentially accomplices to the murder of civilization and history. Without such patrols, more of history will be destroyed.

Q. *What was the experience at Camp Lejeune like for you?*

A. I was very nervous at first, but it was incredibly moving in a way I never expected. The Marines thanked me repeatedly for having been willing to give up my normal activities and devote my time to them. Many felt that Americans had turned their backs on the troops and pointed out that, not only were they giving up years of their lives to protect the country and their own families, but all

American families – and they were losing friends in the process. When you're in the middle of a military base, surrounded by a thousand Marines and their families telling you this, and then you go past a memorial in the hallway decorated with dog tags of the men and women who've been killed in action, it's incredibly moving. At the end of my talk, they gave me a medal and the Marine Corps flag and a T-shirt that said, "The few, the proud, the brave." I was overwhelmed. ■

My hope is that they will come to understand that this heritage is closer to their own world than they otherwise would have thought.

Brian Rose speaks with marines at Camp Lejeune

HOUSE OF

FEAR

It makes me terrified,

Undergrad Writes About the Rain of Bombs in Baghdad

Karl von Clausewitz, the 19th-century Prussian general and military strategist, famously defined war as “the continuation of politics by other means.” For sophomore Thura Al-Windawi, war is family and friends – and whether they get ground up in the teeth of this other kind of “politics.” “What’s going to happen to us?” she wrote in a diary as the full force of Shock and Awe fell upon her and the city of Baghdad. “There is only fear in my house.”

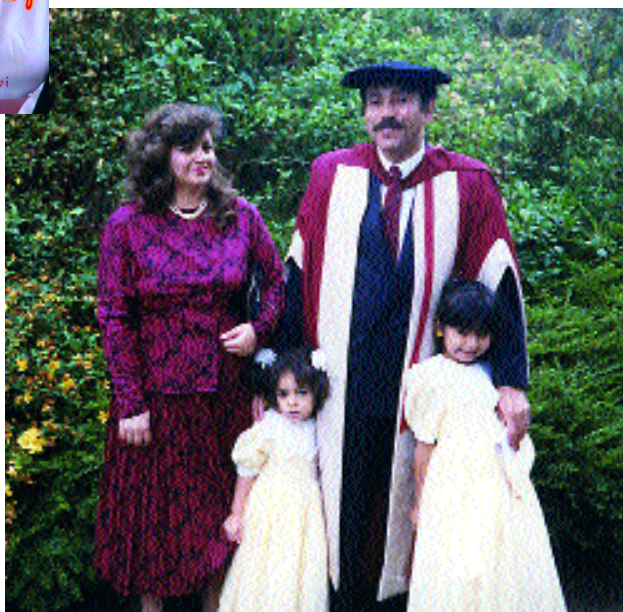
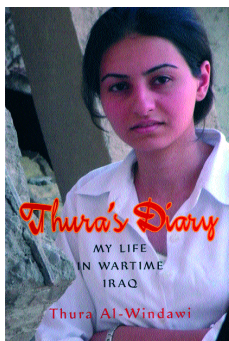
The thoughts and experiences Al-Windawi recorded over six months in 2003 were later published as *Thura’s Diary: My Life in Wartime Iraq*. The diarist eventually found her way to Penn’s campus, where she has struggled with a new language, new customs and a new style of learning. “I sometimes feel I’m almost an American,” she says, “because now I eat Chinese.”

Her father and mother and two sisters moved to Jordan last year after Sama, her youngest sister, disappeared following a car-bomb explosion at the elementary school. Many children and teachers were killed. Her mom was on the phone with Al-Windawi, telling her she had lost hope of even finding Sama’s body. All at once her mother gasped, “Your sister has come home.” Someone had removed Sama from the site of the attack and taken care of her.

Al-Windawi is a striking blend of sweetness and guts. She keeps in touch with her family mostly through webcam and e-mail. Her father, a London-educated professor, has found work as a U.N. consultant to support the family, which in Iraqi society extends to grandparents, aunts, uncles, cousins and even friends. None of those earnings go to his daughter at Penn, who works at the admissions office, a scandal to the extended family. So is her “improper” going out at night with friends. Al-Windawi holds the line on some values of Iraq’s conservative Islamic society, but she’s never made peace with how the role of women is defined. She wants to be a human rights lawyer. Her father sometimes has his doubts too, says Al-Windawi, “but he knew there was something strong in me that I’m able to stand on my feet by myself.”

Her father continues to travel back and forth between Jordan and Iraq looking after the family, and Mrs. Al-Windawi worries about him, about her daughters, and about all the relatives back home. For now, the family is, if not together, then at least alive. And that’s a lot to be thankful for as the “politics” of ethnicity and nation-building and Islam and oil go grinding on. “The really hard times are when I have to show a strong face for my mother and my sister,” Al-Windawi says, “which is an image that is not really real.”

In the spring, *Thura’s Diary* was selected as a 2005 Christopher Award winner. Christophers recognize books, films and TV productions that “affirm the highest values of the human spirit.” The following are excerpts from *Thura’s Diary*.



Thura (right) and parents with sister Aula

From *Thura’s Diary* by Thura Al-Windawi, translated by Robin Bray, copyright 2004 by Thura Al-Windawi. Used by permission of Viking Children’s Books, a division of Penguin Young Readers Group, a member of Penguin Group (USA) Inc., 345 Hudson St., New York, NY 10014. All rights reserved.

always thinking, *Am I going to live or am I going to die?*

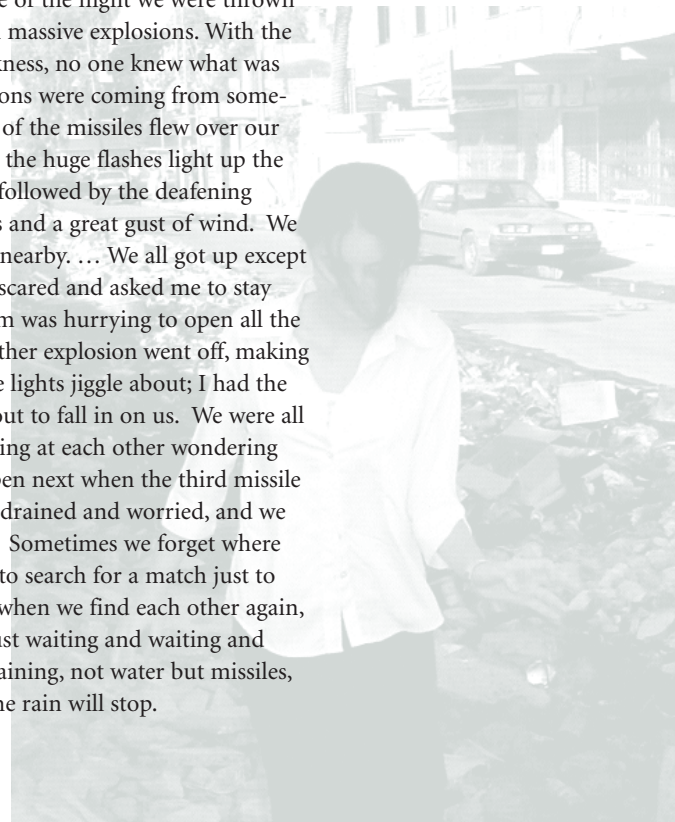
15 March | What is happening to my city? My family and I drove past the passport office in Baghdad today. There was a huge line, with hundreds of people pushing and shoving to get to the front. They're trying to run from this hell. I have always known this war was coming, but now, for the first time, it seems real. People are not acting as they usually do. They are starting to panic. I wonder if any of them will be leaving relatives behind to save themselves.

20 March | I hear and feel the first missiles exploding – when the earth shakes, your whole body shakes as well. ... A little while later everything went quiet outside, and all of us in Granny's room were silent, too. Granny told everyone to go back to bed. We were all looking at each other calmly but no one said anything, although there were all sorts of questions going through our minds. Everyone looked confused. "I don't want any of you to be afraid," Granny said. "We're going to be hearing noises like these all day, every day, so we'd better get used to them." We all respect Granny and love her so much. She's a very strong woman ... and she has seen many wars. She kept telling us not to be afraid and to control our tempers, as "there is so much more to come."

30 March | Today was a really sad day. The Doura district in south Baghdad came under attack from cluster bombs. We've got quite a few friends who live there, as well as one of my other cousins and his family. We were all so worried about them, but we couldn't phone or go to see them. ... On TV they've been showing children who've been taken to hospital with terrible burns. I had tears pouring down my face as I watched, wondering if such terrible things could happen to me, or any of the people I love. ... There are men and children dying, and women crying for them. What kind of hatred must they be feeling for the invaders whose leaders say they've sent in their armies to liberate us? And what kind of hatred for the Iraqi leadership as well?

1 April | Today is April Fool's Day, but now's not the time for jokes. I saw a coffin being brought into the neighborhood, covered with an Iraqi flag. Everybody was looking outside wondering if it was a relative of theirs – their son or their husband or their brother. ... At eight o'clock in the morning Mum told everyone to get up. Then she listened to what they were saying on the news about the way the war was going. No one pays any attention to what the politicians are saying any more.

2 April | In the middle of the night we were thrown out of our beds by such massive explosions. With the whole city in pitch darkness, no one knew what was happening. The explosions were coming from somewhere nearby. ... Some of the missiles flew over our house and we could see the huge flashes light up the sky when each one hit, followed by the deafening sound of the explosions and a great gust of wind. We also heard glass shatter nearby. ... We all got up except for Sama, who was too scared and asked me to stay next to her. Just as Mum was hurrying to open all the doors of the house, another explosion went off, making the house shake and the lights jiggle about; I had the feeling the roof was about to fall in on us. We were all rooted to the spot, looking at each other wondering what was going to happen next when the third missile fell. ... Everyone is just drained and worried, and we don't know what to do. Sometimes we forget where the candles are or have to search for a match just to have a light. And then when we find each other again, we sit down together, just waiting and waiting and waiting. Overhead it's raining, not water but missiles, and we wonder when the rain will stop.



Al-Windawi in Baghdad, August 2003

Overhead it's raining, *not water but missiles*, and we wonder when the rain will stop.

4 April | Last night we didn't sleep. The air was full of fumes from the bombs. My head was on the pillow but I was not comfortable inside the room. Sleeping together, there is no space and we were all looking around and listening for each bomb. How far away are they? How near? It makes me terrified, always thinking, *Am I going to live or am I going to die?*

5 April | To our huge relief Uncle Ali and his wife arrived tonight. They were both completely exhausted; they'd been trapped in their home while the fighting was going on in south Baghdad, but last night the Americans moved on. They were the first members of our family to see the Americans. "They were just as scared as we were," Uncle Ali said.



Jeff Fusco/Photo/John Weekly

12 April | We saw many Americans up close. One was around my age. He had beautiful sunglasses, and when I got close I could see he was really handsome. ... I had all sorts of questions I wanted to ask him, to do with the way we saw him

and the way he saw us. Will we and the Americans ever come to understand each other? Will I be able to talk to that soldier one day? ... I tell Dad that if he comes near us, I hope he will be friendly – but I think he's probably a monster.

26 April | There is a lot of crime these days. In some ways, if the Baath Party were still around, it would be safer because they'd keep things under control. ... [T]he party was not all bad. They did solve all sorts of problems, but the Americans don't make distinctions. ... *Will my country ever be at peace?* I ask myself. The problem now isn't just the Americans, it's the Iraqis themselves, who've started killing each other. It's terrible. ... [T]he streets really aren't safe at the moment. I've learnt a lot this year and gained a lot, but what do the years ahead hold in store for me?

14 December | Today is a historic day. It's been confirmed that Saddam Hussein was captured last night. ... [E]ven though it was an incredible day, the troubles for my country are not over. There will still be fighting between Iraqis and Americans and the problems in Iraq will continue. ... A part of me felt sad too, but not because Saddam was gone. I think it was just because we were used to seeing him like a lion. We were used to being afraid. But now, the lion is gone. I hope the fear will go away too. ■



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MATHEMATICIAN FINDS
MAGIC IN NUMBERS

The Wizard

Strategy and luck – that’s what Richard Garfield, C’85, Gr’93, is all about. A former math professor, Garfield created a new genre of trading-card game when he released *Magic: The Gathering* in 1993. What began as a favorite of fantasy aficionados huddled at tabletops alchemized into a worldwide phenomenon that includes national tournaments and pro tours. Today, there are more than 6 million *Magic* players, and Garfield has started looking at the world of electronic gaming.

As a teenager, he discovered *Dungeons and Dragons*, a role-playing game popular in the 1970s, as well as chess, bridge and the Japanese strategy game *Go*. In his undergraduate days at Penn, Garfield never imagined making a career in games, which had always been a serious hobby. His plan was to work in academia. At first, he was drawn to English and physics before exploring music theory and philosophy. It was in junior year, however, that luck – set in play by an eagerness to try new things – led him into mathematics, which finally trumped every other major.

In hindsight, it seems a given that he would find himself engrossed in numbers. Like games, Garfield says, each math system has its own frame of rules, which structures what can be

proven. A great game also has a set of rules that players use to reach a preferred outcome, that is, to win.

Garfield merged his two great loves and created a runaway hit that combines the fantasy of *Dungeons and Dragons*, the strategy of chess and the logic of *Go* – with a little luck in the shuffle of the deck. In *Magic*, fictional creatures and their strengths are represented on cards. As in games like poker and pinochle, some cards trump others. But unlike those games, there is no standard deck, so players can buy and trade cards to build their creature collections and better their chances.

Each player – each wizard – begins the game with 20 life points. Although there are as many ways to play *Magic* as there are cards, the object is for players to use the creatures on their cards to defeat an opponent’s menagerie. The game ends when one wizard loses all life points.

Even though he is something of a mythic figure among *Magic* devotees, Garfield never stops challenging himself to find something to like in everything. He believes the first impulse one feels to dislike something can be willed to be otherwise, which means we have control over what we like and what we don’t. With that in mind, he will eat anything once –



Wizards of the Coast

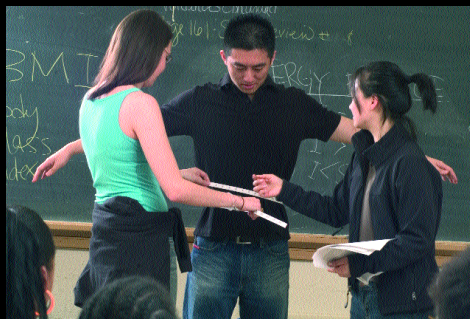
GARFIELD MERGED HIS TWO GREAT LOVES
AND CREATED A RUNAWAY HIT.

sometimes more than once – and will keep trying something until he grows to like it. So he’ll dine on natto (pungent, fridge-ripened beans, slightly bloated and covered in spider webs of slime) and those black, fermented, thousand-year eggs.

Like the endings in the games he loves, Garfield himself is the outcome of strategy and luck. The strategy? Being open-minded and going after new experiences. And the luck? Finding the math card in Penn’s deck. Suddenly, that magical mix landed him in a career he never thought he’d be lucky enough to have. Somehow, he must have played his cards right. ■

Mind Games

STUDENTS TEACH THE ABCs OF NEUROSCIENCE



A clutch of nine students is gathered around a blacktopped table in the basement of the Solomon Psychology Lab. A laptop, aglow with the outline of a lesson plan, is at the center of their brainstorming. It's the weekly planning session for the ABCs of Neuroscience, and the class is preparing a lesson on memory

some of them will teach at the Sayre School just west of campus. Words and ideas, those bumptious brainchildren, bounce around the room from brain to brain – coruscating across neurons, leaping synapses, changing minds. The class has to explain how the brain stores and retrieves information, but they need to do it in a way that ninth-graders can wrap their minds around.

"We'll stage a kidnapping in front of the class," Tyler Wallen strategizes. "It'll demonstrate how the memories of eye witnesses aren't always reliable."

"The kids might interpret the skit as carte blanche for free time," someone cautions. The students are groping for the ideal mix of science and fun – fun with a lid on it.

Steve Fluharty, C'79, Gr'81, a veterinary school professor, is at the table too, scribbling notes. "You should think about time management," he offers. "Each demonstration will take about five minutes, right?" Fluharty directs the School's biological basis of behavior program, the multidisciplinary major that most of these students have declared. Now and then he throws in a heads-up on something

they might have missed, and sometimes he seizes the opportunity to give a neuroscience mini-lecture. Mostly, though, he's a hands-off teacher, leaving room for his students to devise their own lesson plans for interactive, hands-on activities that will teach high schoolers how the brain works.

Each Thursday, after a Tuesday strategy session, the Penn students hop vans into West Philly with plans and props and attention-grabbing activities about some aspect of brain function. Topics include neurons, taste and smell, learning, depression and addiction. This week's class is on hunger and obesity.

The Sayre kids wear black and white uniforms. Some are slumped in chairs, but most are chattering. A banner above the blackboard in front of the classroom reads, Wanted: Inquiring Minds. Heaped on a table at the back are white buckets, plastic funnels, toilet paper rolls wrapped in duct tape and strings of lights that together made a room-size neuron in an earlier lesson.

"What is hunger?" Clara Lee begins. "What happens?"

"Your stomach growls and your mouth waters," a ninth-grader responds.

"And how do you know when you're full?"

To demonstrate how the brain knows when to stop eating, they build a "human pathway model." The Penn students marshal a group of kids into a line, each one representing a part in the interlinked brain-nutrition signal system. A picture poster of a brain or small intestine or other organ hangs on

each member along the pathway. Other students gather crumpled newspaper to stand in as food. "Is that dessert?" one of the kids cracks. Balls of paper get passed through the mouth and down the line to Giselle Kohler, the stomach, who stands in a bulging garbage bag.

Amid the turbulence and the talking out of turn, the Penn students doggedly translate the behaviors and sensations of eating into brain science. This fall, the ninth-graders will put their new knowledge to work when they help build interactive learning stations for third- and fourth-graders for a Kid's Judge! Neuroscience Fair on Penn's campus. The Sayre students seem to be picking up the terms and ideas left behind by their ABC instructors.

Penn student Rushil Rao reports that during one lesson, some "class clowns mentioned a neurotransmitter uptake mechanism that had been introduced weeks ago. I literally snapped my head in their direction and said, 'Holy cow! Where'd that come from?'"

Narek Shaverdian, another Penn undergrad, believes the ABCs of Neuroscience has sown "sparks of excitement" in the minds of the Sayre students, but Fluharty traces the pathway back the other way. Speaking of the ninth-graders, he comments, "These kids don't realize what a wonderful learning opportunity they're giving to our students." ■

—PETER NICHOLS

The students are groping for the ideal mix of science and fun.



Top: Steve Fluharty (left) and Penn students at Sayre School
Bottom: 2004 Kids Judge! Neuroscience Fair

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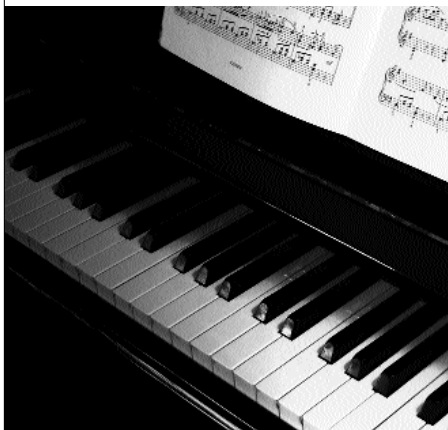
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Lisa Coffrey

Lawrence Sherman and Jerry Lee

PARTNERS Partners in Crime

“He found me on the Internet,” Albert M. Greenfield Professor of Human Relations and renowned criminologist **Lawrence Sherman** quips of how he met **Jerry Lee**. Lee, a pioneering broadcaster with a lifelong concern for the problem of crime, elaborates: “I was surfing the Web when I came across a report [which Sherman co-authored] on the Department of Justice page entitled ‘Preventing Crime: What Works, What Doesn’t, What’s Promising.’ I downloaded it and read it almost nonstop.” Days later, Sherman and Lee were sitting face to face discussing their shared interest in crime prevention.

Today, more than eight years later, they continue to work together toward a better understanding of the causes and prevention of crime. One of the most fruitful results of their collaboration is the Jerry Lee Center of Criminology, a research institute that

Lee established in 2001 with an initial \$5 million gift from the Jerry Lee Foundation. The idea for the center sprang from their recognition of a need for an interdisciplinary resource devoted to the scientific study of crime that would build on Penn’s foundation of criminology scholarship. Sherman, who directs the center, points out that it has become the “world’s largest program of randomized controlled trials of crime prevention and justice.”

Lee, who funded two assistant professorships in the criminology department, says that Sherman brings to the center “a brilliant and open mind” as well as an ability to implement ideas. Sherman, meanwhile, explains that Lee is the source of many of these ideas and calls him “the force that keeps me and the enterprise going.”

—BROOKE ERIN DUFFY

Gift of Music

The new Fisher-Bennett Hall needs a few good pianos. Part of the \$23 million renovation of Fisher-Bennett Hall will include extensive revamping of the fourth floor to enhance the teaching of music at Penn. The refurbishment will also make available to students round-the-clock practice facilities. The classrooms and practice spaces are in need of high-quality

baby grand pianos. Please consider donating one to help complete the new music complex in Fisher-Bennett Hall or for practice rooms in the College Houses. The cost of moving and transportation would need to be included in your gift. Send a little music into the world. To donate a piano, please contact Beth Wright at 215-898-5262 or ewright@sas.upenn.edu.

Collaborating on Collaboration

Last year, **David B. Weigle, W'69**, wanted to put music where the students are. So he provided funding for the College House Music Program. The idea was to bring professional musicians to undergraduate residences for lessons and recitals. Now he wants to bring students to the library. The result is the David B. Weigle Information Commons, a joint undertaking by SAS and Van Pelt Library that will support undergraduates as they conduct research and experiment with technology and collaborative learning. "When Dean Bushnell called the information commons one of her top priorities but needed additional funds to make it happen, I knew I had to act," said Weigle, who is president of Swan Engineering and a library overseer.

The Weigle information commons, slated to open this spring, will be housed in the library and incorporate the College Tech Center, the Digital Media Center and the Student Learning Laboratory. The technology-rich space will support study groups and collaborative projects, and will offer training, equipment and support for work with video, Web publishing and other digital media. There will also be programs and services to make students better learners, writers, presenters and researchers. "The information commons will provide a central location for students to enhance their skills," Weigle notes. "As an undergraduate, I could have used these resources."



Ann Beha Architects

The Business of Science

Following in the tradition of successful interschool initiatives like the Huntsman Program in International Studies & Business comes Penn's newest interdisciplinary initiative, the Roy and Diana Vagelos Program in Life Sciences and Management. The new program will combine the liberal arts education offered by the School of Arts and Sciences and the business education provided by the Wharton School to give students the scientific and entrepreneurial background needed for success in the complex world of biotechnology.

The curriculum integrates science and business coursework and includes internships in both fields as well as a year-long independent research project. Students will earn either a B.A. in science with a business concentration or a B.S. in economics with a science concentration. The program, which started in the fall, will prepare under-

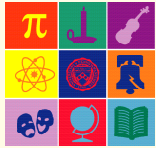
graduates for management careers in such rapidly growing fields as pharmaceuticals, human health, agriculture, animal health, genetics and basic biological and biochemical sciences.

According to College Dean Dennis DeTurck, "the program takes advantage of Penn's unique combination of strengths in the life sciences and its outstanding undergraduate business school." Although the program is only a few months old, he added, student interest is already strong.

The new collaboration has been made possible through the vision and support of former Penn trustee **P. Roy Vagelos, M.D., C'50, Hon'99**, who, with his wife, **Diana**, made a generous commitment through the **Marianthi Foundation**. **Robert L. Benz, M.D., C'74**, and **Marie Uberti-Benz, M.D., Res'82**, **David D. Elliman, C'73, WG'77**, and **Decision Resources Inc.** have also pledged their support.



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 Julie Beren Platt, C'79, & Marc E. Platt, C'79, parents
 Marsha M. Plotnitsky, C'78, WG'80
 Frederick W. Plugge IV, C'53
 David Chun-Yee Pong, W'91
 David S. Pottruck, C'70, WG'72, & Emily Scott Pottruck
 Maury Povich, C'62
 Michael J. Price, W'79, & Vikki L. Price
 Howard E. Rachofsky, W'66
 Edward Raice, C'78, W'78, & Lisa Herman Raice, W'79, WG'79
 Ann Nolan Reese, CW'74, parent
 Daniel S. Reich, parent
 John R. Reinsberg, C'78
 Donald P. Rosen, C'78, parent
 Harold L. Rosenberg, W'79
 Susan K. & Howard David Ross, W'78, parents
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 The Rothfeld Family
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 Amy Bright Ruben, C'82, & Richard Ruben
 Nancy Peters Ryan, CW'61
 Susan Small Savitsky, CW'75, parent
 Brian Scanlan, W'84, & Cynthia Chang Scanlan, C'84
 Sonia S. Schacterle, CW'50, G'51, & George R. Schacterle
 Steven M. Schatz, C'69
 Howard B. Schiller, W'84, & Debbie Schiller
 B. Andrew Schmucker, C'87, W'87 & Linda N. Schmucker, C'86
 Mark J. Schwartz, W'79, & Marie L. Schwartz
 Barry A. Schwimmer, W'79, & Barbara M. Schwimmer, W'82
 Richard S. Seltzer, C'63
 Joan & Jerome Serchuck
 Elizabeth Nicholson Sevier, Ed'45, GEd'47, & Francis A.C. Sevier, Ed'47, GrD'55
 Corey R. Shanus, C'78, & Amy Wagner Shanus, C'82

Donna ReffShelley, C'82, & Lawrence A. Shelley, W'80
 Lawrence W. Sherman, HoM'99, & Eva F. Sherman, parents
 Ned L. Sherwood, W'71, & Emily Layzer Sherwood, CW'73
 Alan A. Shuch, WG'75, & Ann Shuch
 Wilma Bulkin Siegel, CW'58
 Howard A. Silverstein, W'69, & Patricia Bleznak Silverstein, C'81
 Laurence B. Simon, C'68, G'74, parent
 Mark J. Simon & Melissa Weiss Simon, NU'88
 Irene Fortgang Simpkins, C'81
 Steven G. Singer, C'82, & Rebecca Feghali Singer, C'84
 J. Peter Skirkanich, W'65, & Geri Skirkanich
 Robert J. Sobel, C'85
 Rajiv Sobti, Gr'84, parent, & Sanjiv Sobti, WG'85, Gr'86
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 David J. Teece, Gr'75
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 The Tung Foundation
 Richard B. Urban, C'79, V'82
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 Hwee Yong Yap-Whang, parent
 Ehsan El-Tahry Zayan, CW'73, parent
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Two Poems

BY CHARLES BERNSTEIN

every lake has a house
& every house has a stove
& every stove has a pot
& every pot has a lid
& every lid has a handle
& every handle has a stem
& every stem has an edge
& every edge has a lining
& every lining has a margin
& every margin has a slit
& every slit has a slope
& every slope has a sum
& every sum has a factor
& every factor has a face
& every face has a thought
& every thought has a trap
& every trap has a door
& every door has a frame
& every frame has a roof
& every roof has a house
& every house has a lake

*Charles Bernstein is the Donald T. Regan Professor of English and co-director of PennSound, an audio poetry archive (<http://www.writing.upenn.edu/pennsound/>). His recent books include *Shadowtime*, *With Strings*, and *Republics of Reality*, 1975-1995. Bernstein wrote a libretto for composer Brian Ferneyhough's opera *Shadowtime*, which made its American premier at New York's Lincoln Center Festival in July.*

Let's Just Say

Let's just say that every time you fall you never hit the ground
Let's just say that when the day ends the night refuses to come
Let's just say that if all else fails you at least you can count on that
Let's just say that a bird in the fist is better than a bird and a foot
Let's just say that the scarlet ambrosia of your innermost longing is
 the nectar of a god who never chooses to visit
Let's just say that if chance accords possibilities, melancholy
 postpones insomnia
Let's just say that sleep is the darker side of dreams
Let's just say that sometimes a rose is just a read flower
Let's just say that every step forward is also a step nowhere
Let's just say that the thirst for knowledge can only be quenched if one
 learns how to remain hungry
Let's just say that green is always a reflection of the idea of green
Let's just say that I encounter myself not in the mirror but in the manure
Let's just say that each door leads to another door
Let's just say that we think it before we see it or better we see it as we think it
Let's just say that a stone's throw might be a world away
Let's just say that love is neither here nor there
Let's just say that the girl is the mother of the woman
Let's just say that without disorder there can be no harmony
Let's just say that the aim is not to win but not to lose too bad
Let's just say that a knife in the back is better than a knife in the heart
Let's just say that between sleep and dreams is the reality behind reality
Let's just say that I am very weak and want to take a bath
Let's just say that the truth is somewhere between us
Let's just say that the top of a tower is not a good place to hide
Let's just say that mankind suffers its language
Let's just say that a bird cannot always be in flight
Let's just say that we're not far from where we would have been
 if we had lived better lives
Let's just say that pretty ugly is an aspiring oxymoron
Let's just say that if the sun is a rock burning in space then
 the earth is a shard hurtling from its designation
Let's just say that little is gained when nothing is lost
Let's just say that the lie of the mind is the light of perception

Crossing Chords

Photo by Lisa Godfrey

Almost every day, Kate Thomas dresses up all in white. The next thing she does is unsheathe a sword – “weapon” is what they call it at the Fencing Academy of Philadelphia. Thomas, a fencing instructor and national competitor, is a graduate student in the music department. “I used to sing pretty seriously,” she comments, “but fencing got in the way.” When she’s not crossing swords, she’s working on her dissertation, crossing chords with a longstanding love of Hollywood musicals. “It’s fun music,” she says.





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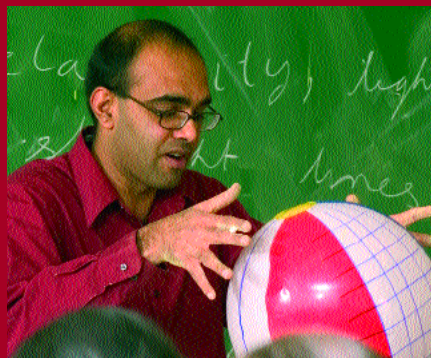
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SCHOOL OF ARTS AND SCIENCES HOMECOMING

Friday, November 4, 2005



The End of Space and Time

4:30 p.m.

Logan Hall, Room 17

249 South 36th Street

Hear cosmologist **Vijay Balasubramanian**, from the physics and astronomy department, describe Einstein's concept of space-time and discuss an emerging picture of a far stranger reality – one where space and time can appear and disappear in to timeless and spaceless voids.

The Penn Symphony Orchestra

8:00 p.m.

Irvine Auditorium

3401 Spruce Street

Rachmaninoff's Piano Concerto No. 2

Tchaikovsky's Symphony No.5

Join the Penn Symphony Orchestra for a performance of two of the most popular Romantic masterworks, featuring Wharton senior and winner of the 2005 Concerto Competition **Jennifer Lee**. Music Director, Brad Smith. Admission is free.