

acumen

A Briefing on Research and Its World Impact • Fall 2008

Ancient texts show the “way”

A web of copyright conflicts

Virtually Jewish

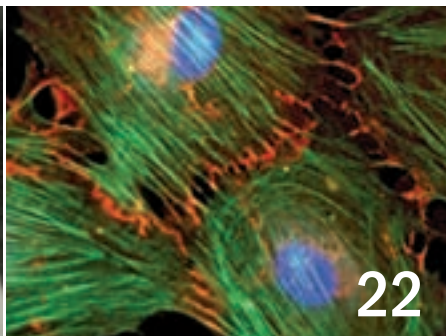
Gold shines on the nano-scale



CONSTRUCTING A
CLIMATE FOR
CHANGE

LEHIGH UNIVERSITY® | COLLEGE OF
ARTS & SCIENCES

Contents



UP FRONT

- 01 MESSAGE FROM THE DEAN**
Advances are coming at the intersections of disciplines.
- 02 THE ARTS**
Objects of his affection ... big strides for Small Steps
- 04 THE HUMANITIES**
The 8th deadly sin ... ancient texts show the "way"...writing from her roots... virtually Jewish
- 07 THE SOCIAL SCIENCES**
Political expression...a web of copyright conflicts...the end of alliances...a past without history
- 10 THE NATURAL SCIENCES**
Gold shines on the nano-scale... structure divulges proteins' role... pictures by the numbers
- 29 THE LAST WORD**
The Lifeblood of a University by Barbara Traister, Associate Dean for Research and Graduate Programs

FEATURES

- 12 CONSTRUCTING A CLIMATE FOR CHANGE**
Examining climatic change of centuries past is helping some researchers and policy makers better understand how to address the environment of the future.
- 18 PROMISE LAND**
Studying the America of the 18th century allows us to better understand where we came from and perhaps where we're headed.
- 22 INNER SPACE**
Researchers are asking some tough questions about the body and the cells that compose it.
- 26 RANDOM ACTS OF KINDNESS?**
One psychologist's quest to find what motivates people to think, feel or behave in ways that reflect concern for the well-being of others.

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Message from the Dean



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Research without borders

The second issue of *Acumen* demonstrates how advances are coming at the intersections of disciplines.

Turn the pages of newspapers and magazines, switch on the radio or TV, browse the Web—it's easy to feel overwhelmed by the challenges we face as a nation and as a leader on the global stage. Issues surrounding health care, conflict resolution, education, environmental change, poverty, energy, and economic prosperity pose significant challenges to communities and nations around the world.

These challenges have extraordinary social, political, economic, and technological implications. Providing affordable and accessible health care and education, transitioning from a hydrocarbon economy, resolving conflicts without resorting to violence or war, providing basic necessities—water, food, and shelter—to low-income populations in the U.S. and around the globe requires change, new thinking, innovation, and creativity. Finding viable solutions also requires cooperation and partnerships across diverse sectors of society: individuals, communities, institutions, organizations, and businesses.

Universities play a special role in helping meet the challenges we face as a society because they create a climate for change.

Universities provide unique opportunities for exploration, discovery, problem solving, and partnership.

Reaching across traditional disciplinary boundaries to integrate fields in the arts, humanities, social sciences, and natural sciences is required to tackle these challenges head-on. Advances are coming at the intersections of disciplines, in settings where people from diverse perspectives and areas of expertise interact to understand the issues and identify solutions. As scholars and educators,

we view challenges as opportunities to learn and to create, to broaden our perspectives on the world and the contexts in which we live.

This issue of *Acumen* explores the environmental and social ramifications of a changing climate, the basic research that leads to new treatments for disease, the origins of our American culture, and the underlying influences that shape our social interactions. It also presents individual and collective faculty contributions to research, scholarship, and creative work.

Research is an essential component of today's universities. Research generates the sparks of discovery that shape our world. To play off our cover story, universities are intellectual ecosystems, webs of interconnected investigations, conversations, and collaborations among fields of scholarship from which we improve and enrich lives.



Research and inquiry are critical components of education, to the generation of new ideas, and to empowering students to take charge of their destinies.

Enjoy this issue of *Acumen*. I look forward to sharing our contributions and accomplishments with you and welcome your thoughts and comments.

Anne S. Meltzer

Herbert and Ann Siegel Dean

Architecture

Objects of his affection

Sculptor. Interactive artist. Architect. It's difficult to define Wes Heiss and he's quite happy with that.

Heiss, a professor of practice in the Department of Art and Architecture, uses his art to investigate the human connection to post-consumer, post-industrial objects. He explores humans' relationships with the objects they create as well as an object's ability to take on a life—projected or literal—of its own. Heiss, who is also a member of the design arts program, seeks to find an object's unexplored potential and people's reactions to objects, and learn why failed objects don't find success.

"Some of my projects veer in the direction of design, some in the direction of fine art. I'm happy

being somewhere in the middle and not picking a clear place to be," says Heiss.

Heiss' background as an architect clearly influences his work, most notably when it comes to the production of his creations. Rather than working within a studio, he prefers to design a piece

and work with others to manufacture the needed components. Using an outsourcing fabrication process, Heiss turns thumbnail sketches into mechanical drawings that provide detailed specifications explaining precisely how to fabricate the various pieces.

"I use my background to directly inform conceptual, functional, formal, and material decisions," he says. "In working with relatively simple and/or out-of-date mechanical and electrical machines, I create nostalgia for a

time when technology was both more awkward and optimistic."

Heiss' body of work ranges from narrative to singular, from digital to physical. Yet there are clear themes that bind these works together. His current work examines the culture of fear that he says is an integral part of the American experience. His work applies emotional, philosophical, and cultural attitudes onto an object and allows an object to speak to that attitude.

Viewer participation is a necessary feature of Heiss' works. In 2004, his project *twice removed* required viewers to take Polaroid images of 280 Polaroid photos that Heiss had shot and secured to a wall. *suburban*, a 2005 installation, would inflate when a viewer stood in a specific place. His latest piece, entitled *husk*, uses the body of a Chevrolet Corvair spinning on a metal frame as viewers sit near the work.

"I like that people have fun with the pieces. I like that about interactive work—as the visitor, you are bringing something to the piece," says Heiss. "I often use overlooked, yet iconic, cultural objects, and hypothetical product prototypes to both literal and metaphorical ends. Futile and dysfunctional, my work puts the viewer in situations that allude to failing romantic notions about the power of man-made objects that surround us."

Captivated by objects that are timely and relevant, Heiss is currently developing an installation

influenced by the Boeing 787 Dreamliner. He says this piece is more design oriented than is his past work and presents a product in a virtual setting. Using the Dreamliner, Heiss hopes to develop a fictional advertising campaign to examine advertising as art. He is creating a conceptual ejection pod for the airliner, developed for a conceptual class of passengers. Heiss will develop the graphic elements, brand identity, and the pod, and present his work in a dry, literal fashion as a viable product. He hopes to develop a half-scale model that looks like a functional model. A physical mock-up of the pod, the associated drawings, and a video will be the culmination.

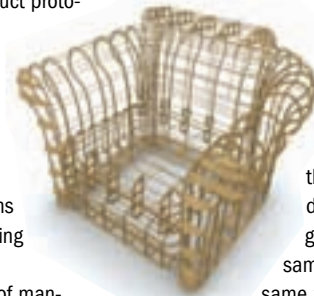
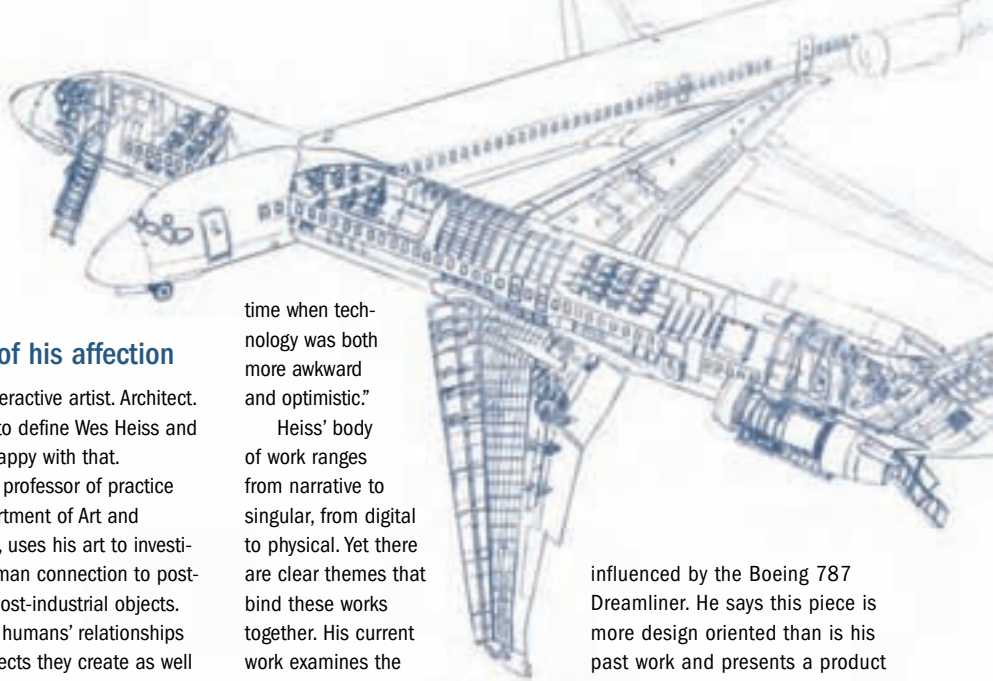
"In this instance, it's not the object that is the art," says Heiss. "It's the advertisement for the thing that is the art."

Heiss recently pitched his Dreamliner installation to the prestigious Max Protech Gallery in New York City. He says his work and the challenges he faces as an artist are as relevant in a gallery as the classroom.

"I think it's good for students to see faculty doing the things they're doing. They witness you going through the same inspirations, the same fears that they have. As an artist I'm at a point where my interests are changing. I don't know where I'm headed, and that's an exciting thing."



Examples of work by Wes Heiss include: *Untitled drawing* (top), *pencil on mylar*; *insidewalk* (above); and an *untitled computer rendering* (right).



Theatre/Music

Big strides for Small Steps

The saying “there are no small roles, only small actors” appeared to hold particularly true in a specially commissioned work which was presented at Lehigh’s Zoellner Arts Center in January. Jellyfish, centipedes, and tree bugs—pivotal roles in *Small Steps, Tiny Revolutions*—came to life on stage thanks to 13 local middle and



elementary-school students, some making their theatrical debut.

Small Steps, Tiny Revolutions is a ballet based on a children’s poem that tells the story of a young boy who loves to dance but is forbidden by his father. Searching for a way to express himself, the boy transports himself into a strange, empty world populated with amazing and colorful beings.

Local middle-school and elementary-school students performed in *Small Steps, Tiny Revolutions*, while the artwork of some Lehigh Valley elementary school children formed the ballet’s production design and choreography.

The ballet was inspired by Deborah Sacarakis, the Zoellner Center director of programs and outreach, who was first motivated to write the story 20 years ago. “I was inspired by watching dancers and the way children respond to live dance performances,” says Sacarakis. “I wanted a project that would suitably commemorate Zoellner’s anniversary.”

The performance was a real coming together for both the arts

community at Lehigh and the community as a whole, and reflects Zoellner’s desire to make theatre accessible and enjoyable to all ages. The score for *Small Steps, Tiny Revolutions* was written by Lehigh University Director of Choral Arts Steven Sametz. Pascal Rioult, renowned dancer, choreographer, and artistic director of the New York-based Pascal Rioult Dance Theatre, choreographed the ballet. Associate professor of theatre Drew Francis designed the costumes and sets. Sametz and Rioult created a scene to convey Sacarakis’ libretto.

“The story itself suggested the musical architecture: the boy’s dance, the father’s interruption, the boy’s escape to a fantasyland filled with colored shapes,” says Sametz. “I started with sketching ideas for the shapes. Since they were not assigned specifically in the libretto, I had the joy of making up music for shapes as I saw them: slinkies, waves, ‘skitterers,’ and bubbles. Each of the shapes had a specific characterization in its music which could be played against any other shape or with the music for the boy and the father. In this way, any character could ‘meet’ another on stage and dance its particular music. This was particularly useful because I knew Pascal would only have limited time to choreograph the children playing the shape roles. The musical construction allowed him to teach one set of steps to a group of children for each shape, and then combine them in an ensemble. The layering created a very organic, very tightly woven score, but still playful and full of character.”

Once the music was composed, Rioult and Francis began to develop the visual world of the ballet and decide how the visions of composer, designer, and choreographer would mesh. The two often worked side by side in the studio, with Francis sketching costumes as Pascal choreographed. “I had a great deal of fun

with him,” Francis says. “He’s got a tremendous sense about what he’s doing. I would say, ‘Let’s try it this way,’ and he would think about it and say, ‘Let’s try it this way.’ It was wonderful to work this way.”

Developing costumes for this production presented design challenges for Francis. Characters move between the real world and a fantastical world. Some of the real world costumes came off the racks of local department stores, and Francis worked with Rioult throughout choreography to understand what movements the dancers would use to ensure these costumes fit properly and functioned as Francis intended. “Every dancer has an individual way of moving on stage, and in this case many of the

and movement through workshops. Some of the performers first heard the *Small Steps, Tiny Revolutions* poem during a workshop two years ago, where they were encouraged to tap their own imaginations. “We tell them not to be afraid to express the thoughts that they have,” says Sacarakis. “For some of these students it’s a brand-new experience.”

During the creativity workshops, the local elementary students created artwork based on *Small Steps, Tiny Revolutions*, some of which went on to inform the production design and choreography. Selected pieces of that artwork were displayed in the Zoellner Arts Center lobby. Students also attended a special school show.

The production was so successful that Rioult is performing the ballet



In *Small Steps, Tiny Revolutions*, a young boy’s forbidden desire to dance leads him to a fantastic land.

dancers were new to performing. You have to help them, as a designer, so they feel safe about what they are doing on stage. You have to get them ready to be on stage through how they move in their costume.”

Small Steps, Tiny Revolutions was the culmination of an outreach project with local elementary schools that introduced students to creativity

in other theatres. For Sametz, it was a new way to approach his craft. Composing is normally an individual enterprise, but Sametz says the collaboration was exceptionally satisfying. “This production was great because it brought together terrific minds who worked together and saw the way in which the piece kept going on to the next level.”



BETTMANN / CORBIS



CHARLEY GALLAY / GETTY IMAGES. (RIGHT) ERICH LESSING / ART RESOURCE, NY



Italian prime minister Benito Mussolini, Greek mythology's Icarus, and celebrity Paris Hilton are examples of arrogance.

Philosophy

The 8th deadly sin

It's a common experience: The customer who cuts in front of you at the checkout line, demanding immediate attention; the so-called expert who responds to your questions with contempt.

Robin Dillon, professor of philosophy, examines the idea of arrogance in her current book project, *Arrogance: The Deadliest Sin*. Dillon, whose body of work in ethics focuses on self-respect, began the project when she realized that arrogance is regarded both negatively and as a trait that makes one a better competitor or leader. She asks if this a characteristic that is both profoundly vicious and yet admirable and worth cultivating; if not both, which is it?

claims arrogance concerns unjustifiable claims including status, authority, rights, and ability.

The second distinction is among kinds of self-respect and respect. The two kinds of arrogance relate in various ways to different kinds of self-respect and respect, Dillon says. One important connection is between status arrogance and what she calls interpersonal recognition respect for others, the kind of respect that all persons morally deserve—and deserve equally—simply in virtue of being persons. Status arrogance itself arises from a failure of interpersonal recognition self-respect, the recognition and proper valuing of

oneself as an equal among equals.

A second connection is between unwarrantable claims arrogance and what Dillon titles agentic recognition self-respect. This form of self-respect involves properly valuing oneself as a moral agent and taking one's responsibilities seriously. Unwarrantable claims arrogance involves the absence of agentic recognition self-respect. In both cases, arrogance involves sacrificing self-respect to boost self-esteem, the state of thinking well of and feeling good about oneself. This trade-off, Dillon argues, is the root of all vice.

But there is another dimension to arrogance, which becomes visible when Dillon takes up a feminist perspective. She argues that arrogance is a gendered concept, one that is applied more often to masculine behavior than feminine, because arrogance is centrally about power. Calling women arrogant is often a way of undercutting

One key to understanding arrogance is to see it as the antithesis of respect for others and self-respect. "Arrogance is not a merely irritating bad habit. It is a corrosive and debasing vice that thwarts human flourishing and blights human community," she says. An arrogant person's actions or attitudes can be hurtful and harmful, but they are also profoundly disrespectful. Arrogance also damages the arrogant individual in a way and to a degree that other vices do not, because it is a failure to respect oneself.

Dillon analyzes arrogance using three distinctions. The first describes the types of arrogance, which she calls status arrogance and unwarrantable claims arrogance. Each of these involves different beliefs, attitudes, objects, and desires. Status arrogance is the presumptuous sense of superiority that involves regarding other people disdainfully, condescendingly, or dismissively. Unwarrantable

their legitimate claims to power or status. Thinking about gender and power prompts Dillon to argue that while most arrogance is a deadly vice, “a certain form of unwarrantable claims arrogance would, for subordinated people, be self-respecting and morally appropriate, and it could be of great value in resisting oppression.”

Dillon argues that careful attention to arrogance is essential to answering the questions that lie at the very heart of the moral life: How should we live our lives? What kinds of persons is it good for us to be? What should we value and how should we value it?

Modern Languages & Literature

Ancient texts show the “way”

In the last two decades, studies of excavated Chinese texts have illuminated ancient Chinese history. One of the formative eras of pre-imperial China, the Zhou (11th–3rd centuries BCE), was a time of tremendous political and social transformation—experiencing the rise and fall of political hegemonies and sacred kingships, the transition from simple to complex agricultural economies, extensive contact with other regional cultures, and increasing literary production. Such changes are reflected in texts written on bone, bronze, and bamboo found in ancient caches and tombs.

Constance Cook, professor of Chinese language and literature and director of the Asian Studies program and the Lehigh in Shanghai Internship Program, focuses on texts excavated from tombs in

Bronze Age China that reflect a hierarchical system of ancestor worship that was ultimately transformed by the followers of Confucius into a program for the education of youth and self-transformation.

As part of a project funded by the National Endowment for the Humanities, Cook is examining the concept of the Dao—the “path” or “way” in Chinese philosophy—as it arose out of the worship of founder ancestors, particularly the Zhou founders, and was tied to the rise of clan-based states with a need for a “national” identity. Using ethnographic studies from other traditional cultures as well as transmitted and excavated texts from ancient China, Cook studies the role of founder worship rituals in

the preservation and manipulation of social memory. For a ruler, fostering an ancestral or pseudo-ancestral connection to a mythical or semi-mythical ancient king through a lineage relationship bought a seat at the political negotiating table. It conferred authenticity as well as economic rights. For a disenfranchised elite male, the ritual practices used to maintain these connections were a lifeline to personal power beyond politics.

Cook focuses on the repetition and evolution of the ritual choreography, liturgy, and rhetoric that began with ancestor worship and ended with the Confucian institution of education. “The performance of forms of this ritual informed all secular and sacred relationships; they defined a person’s social and political identity,” she says. “Ritual had to do with the creation and maintenance of these identities.”

This “Way of the Former Kings” reached a peak of popularity toward the end of the Zhou period and was fundamental to the Confucian emphasis on education. Learning, for the early Confucians, was the path to recreating oneself in the model of a particular ancient sage king. The rhetoric of this “Way” can be traced back through time to the earliest Zhou bronze inscriptions.

The roots of Confucian practice are especially evident in the promotion ceremonies performed by elite youths when they were awarded the positions occupied by their fathers, Cook says. While the majority of inscriptions testify an allegiance to the Zhou founders, minority traditions—such as one for women and others for non-Zhou clans with different founders—become increasingly evident over time. Some minority traditions may have been behind many of the anti-Confucian

movements or the cacophony of different “Ways” in the later Zhou era. With the collapse of the Zhou kinship-based hierarchy and the rise of non-Zhou powers, the meaning of Dao shifted away from following an ancestrally defined ritual practice to one of abstract forces of nature, such as Yin and Yang and the five elemental energies—wood, fire, earth, metal, and water.

English

Writing from her roots

Stepping inside Stephanie Powell Watts’s office, one has little trouble deciphering not only her profession, but her passion. Floor-to-ceiling shelves are lined with books and a stack of thumb-through paperbacks rests handily next to her computer.



THEO ANDERSON

Stephanie Powell Watts, assistant professor of English, has been cited for her authentic voice in her short stories.

Watts, assistant professor of English, eagerly rattles off the names of her favorite authors—John Updike, Edward Jones, Toni Morrison, Philip Roth, Gayle Jones—and beams when describing their gift as writers. She likes Jones for her strong narrative voice and intimacy with the characters. Morrison’s *Song of Solomon*, she says, is “one of those books you would’ve given anything to write.”



Left, an Ancient Terra Cotta Warrior. Above, an example of ancient Chinese writing scripts from c. 1300 BC.

MEIYEN SU / CORBIS

The Humanities (continued)

What these things fail to divulge is that she is a truly accomplished author in her own right. In the last year a wave of awards and recognition has rolled in for Watts in what she humbly describes as “crazy.”

Drawing on her North Carolina roots, Watts covers themes of family, religion, and the South for her short stories and nonfiction essays. “There’s something really fascinating about the place and the tightrope walking you have to do. There are lots of assumptions people make, even in the classroom, about southerners and southern experiences,” she says.

That ability to deftly tightrope walk landed Watts the honor of “Best Emerging Writer” at the Southern Women Writers Conference last year for her short story “Family Museum of Ancient Postcards.” “Short stories are underrated and not widely read,” says Watts. “But the tightness and precision is a real gift. Short stories give you the enormity of a person’s life in a few pages. It’s a true American art form.”

Another short story, “Unassigned Territory,” received a flurry of interest from notable publications. It was selected for publication in the *Oxford American’s* Winter Reading Issue in 2006. The story, which follows two Jehovah’s Witnesses through North Carolina in search of converts, was also named a 2007 Distinguished Story in *Best American Short Stories*, edited by Stephen King, and was included in *New Stories from the South: Best of 2007*, selected by Pulitzer Prize winner Edward Jones.

The accolades continued when “Unassigned Territory” went on to receive the prestigious 2007 Pushcart Prize, one of the most honored literary projects in America. With this, Watts, still early in her career, joined an elite group of American fiction writers and fellow Pushcart Prize winners such as Raymond Carver, Tim O’Brien, and John Irving.

Watts recently completed her biggest composition to date—a

novel—which she is looking to publish. “It’s bigger than I really realized,” says Watts on completing the novel, *Possessing Hours*. “Writing a short story and writing a novel are similar movements, but it’s not like adding water to make it bigger.”

Religion Studies

Virtually Jewish

Like any religion, Judaism has its periods of innovation and return to tradition. But today, the institutions and frameworks of North American Judaism are struggling to recruit and retain younger members. Some commentators argue that Jewish life in the current era is on the decline. But beyond these frameworks, a vibrant music scene, a burgeoning

multiplayer online role-playing game, Second Life boasts a vibrant Judaic community that is virtually thriving.

This other world is allowing Weissler, along with undergraduate research assistant Dustin McCrae, to observe how religious rituals are carried out online. Anchored by a home synagogue, user-generated communities allow members around the world to host religious ceremonies, light Sabbath candles, plan events, conduct Hebrew classes and create personal relationships with others, without leaving their desktop.

Under her nom d’avatar Taybe Abramovic, Weissler has immersed herself in robust virtual Jewish neighborhoods and befriended members, known as avatars, to better understand how religious life is carried out in the present era. She’s hoping to



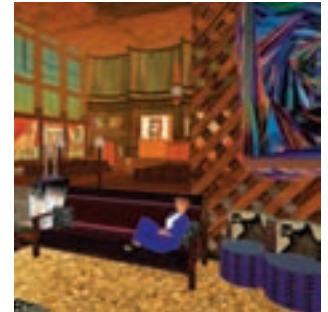
Above, Chava Weissler’s avatar attends a candle lighting in a virtual Jewish community in Second Life. Above right, Weissler’s avatar sits and reflects in a synagogue.

arts community, and contemporary publications indicate that Jewish life is very much alive and flourishing.

Perhaps this is nowhere more apparent than on the Web. While conducting research for an experimental course on the Judaism of 20-somethings, Chava Weissler, the Philip and Muriel Berman Professor of Jewish Civilization in the Department of Religion Studies, landed in a place that was oddly both familiar and foreign—the 3-D online world of Second Life. Created as a massively

glean how people maintain the relationship between their Jewish life in Second Life, and that of their real life.

“You don’t really know who they are in real life,” says Weissler. In fact, she says, some people behind the avatars aren’t actually Jewish. “Research has found that this is one of the characteristics of the venues that appeals to young Jewish people—they want to go to places where the population is mixed. Many young people don’t want to have exclusively Jewish experiences.”



In observing this crossover from real life to Second Life, Weissler has discovered that the virtual world can provide privacy and comfort for people looking to further explore the Jewish religion, as it can be easier to teleport into Second Life than walk into a synagogue. Weissler has also encountered people hindered by disabilities in real life, for which the Second Life candle lighting is the only means to practice a sacred religious tradition. One Orthodox woman Weissler has studied allows her avatar to engage in practices not permitted in her real-life community.

But, as Weissler has found, Jewish life in the virtual world is also not immune from real-world intolerance. Observant Jews who abstain from using the computer on Saturday sometimes find that their space has been covered in swastikas while they were offline.

Weissler’s research dovetails with her interest in the Jewish renewal movement—a group of North American Jews rethinking innovative ways of practicing Judaism “outside the box.” “These groups don’t necessarily look to institutional authorities for how they practice Judaism,” says Weissler. “Second Life is interesting in that regard as well. Many Christian churches have official Second Life sims [sites], but the Jewish sims spring from a more grassroots creativity. Jewish ‘residents’ of Second Life create what they’d like, from a synagogue to a replica of the ancient Jerusalem to a ‘Hogwarts Yeshiva.’ It’s more than a presence—it’s an organic community.”

The Social Sciences

Political Science

Political expression

Bush v. Gore brought to the public's attention the significance of election law and the United States Supreme Court's role in structuring the rules that govern how campaigns and elections function in America. Brian Pinaire, assistant professor of political science, examines freedom of speech in the political process or, what he terms, electoral speech law. "Electoral speech" is any political practice, action, or article (such as contributing money or circulating petitions) that has been construed by the Supreme Court as effectively "expression" for First Amendment purposes.

Against the backdrop of an examination of the full range of cases within this doctrinal category (39 in total, ranging from World War II to the present), Pinaire's book, *The Constitution of*

Electoral Law Speech, presents four case studies that illuminate the significance of issue framing, timing, context, and preferences as the justices evaluate competing claims about freedom of speech within the electoral process. These case studies—addressing the solicitation of votes outside the polling place, the relationship between identity and issue in terms of anonymous political leafleting, the prospects for political conversations within petition circulation drives, and the ongoing debate over the influence of campaign contributions on state-level political races—are built around Pinaire's archival and interview-based research conducted on-site in four states.

Campaign finance challenges constitute the majority of electoral speech cases that Pinaire studied, and such issues reflect the significance of the architecture of electoral speech law. For example, federal election law limits how much individuals may contribute, but the Court has consistently maintained that individual expenditures, by contrast, are constitutionally protected political expression. This distinction, enshrined in the *Buckley v. Valeo* ruling of the mid-1970s, has radically reshaped

American politics, as candidates, parties, unions, and various other interests have had to adapt to the Court's evolving conceptions of free speech (stressing individual liberty, participatory parity, and a cleaner political process) and its implications for democracy in America.

Much of this is evident in the present presidential campaign. As a

function of the Court's rulings in *Buckley* and its progeny over the last three decades, interested parties have had to become more creative as they seek to use money to influence the political process.

Specifically, Pinaire notes that so-called "527 groups" (named for the provision of the tax code with which they are associated) are a direct result of the Supreme Court's electoral speech decisions. These groups and their advertisements had a profound influence on the 2004 election (e.g. "Swift Boat Veterans for Truth") and Pinaire expects more of the same during this cycle. Money, he suggests, is like water pressing up against the dam: It always seems to find its way in. The question the justices face over and over is, "What is to be done?"



JOSE FUSTE RAGA / CORBIS

Supreme Court justices have evaluated competing claims about freedom of speech within the electoral process.

Journalism and Communications

A web of copyright conflicts

As Web 2.0 further extends our communications options, a battle is brewing between copyright owners and search engines.

Search engines are typically seen as an asset to Web site owners, who typically vie for a high search-results ranking in order to raise visibility and drive traffic to their sites. But some Web site owners claim their copyright is being violated when their material is cached, electronically copied, and stored by search engines such as Google or Yahoo! By accessing the cached copy rather than re-fetching the original page, the access time is shorter, but caching is done without permission of whoever created the original file.

This conflict between copyright owners and search engines is of particular interest to Kathy Olson, associate professor of journalism



The Social Sciences (continued)



DOUGLAS BENEDICT

Kathy Olson draws on her background in both law and journalism to examine copyright conflicts.

and communication, who researches copyright law and the issues surrounding the fair use doctrine. Olson says the Internet has resulted in an explosion of copyright conflicts as owners of intellectual property try to protect their rights online. Digital technology poses a greater threat than technological advances in the past because text and images can be reproduced not just once, but an infinite number of times without copies degrading and losing their quality.

"Copyright owners are trying to find new ways to protect their rights, such as contracts, licensing, and digital-rights management. That's a problem, because when you lock up the work, things like fair use are completely shut out," says Olson. "As readers, we have a right to look at an author's article and use it or quote small parts of it. That tension between copyright owners and people who need to use the copyrighted work has to be addressed."

Copyright lies at the heart of every Web index. When Web surfers look for a needed story or image, every search produces a thumbnail or cached article that is created by copying the image directly from the original source without express written consent of the author. At the same time, the fair use doctrine generally allows some copying, without permission, when it is done for socially beneficial uses.

Olson has researched cases in which the courts have examined the question of whether search engines can conduct this copying under fair use. So far the courts have ruled in favor of search engines, and Olson agrees with the outcome, if not the courts' reasoning. While search engines need leeway and protection for necessary copying, she argues, the fair use doctrine is not the best way to do it. Because the fair use doctrine looks at a number of case-specific factors in deciding whether the particular use is fair, it is better suited to traditional uses where a case-by-case analysis is necessary.

"Search engines are so integral to using the World Wide Web, and harnessing the information on it, that they must have much broader permission to do this kind of necessary copying," Olson says. "The fair use doctrine is too variable and unpredictable to give search engines the safe harbor they need to do their jobs." Olson calls for an alternative to a case-by-case analysis of fair use for search engines, such as blanket statutory protection or acknowledgment that search engines have an implied license to copy Web pages for indexing. "When you put something on the Web, it's up to you to allow or block search engines from finding and indexing your page. If you don't opt out, it's going to be copied by search engines. Because the technology exists to block these searches, there should be almost a shifting of the burden from asking for permission to copy to denying permission."

International Relations

The end of alliances

With the end of the Cold War, a new paradigm for American foreign policy is slowly but surely emerging, says Rajan Menon, the Monroe J. Rathbone Professor of International Relations.

Relegated to the history books is the ideologically driven rivalry of two superpowers and their competing network of alliances around the world, along with concepts such as the nuclear "balance of terror."

The author of *End of Alliances*, Menon says those old realities have been replaced by new ones: a depleted Russia, overextended American military forces, the emergence of China and India as major powers, the rise of transnational terrorism, the problem of failed states, entrenched global poverty, and accelerating environmental degradation.

Indeed, Menon asks, why should the United States cling to Cold War-era military alliances that have been rendered superfluous, ineffective, and obsolete by a world that bears

little resemblance to that of the Cold War?

"We are," he says, "in the early stages of what will prove to be a redefinition in the means and ends of American statecraft: a total reordering of the way we deal with others and others with us."

In essence, the U.S. grand strategy of containment will be supplanted by one that engages the world through fluid alignments that shift, depending on the issues at hand.

The slow-motion shift already underway casts doubt on the staying power of U.S.-led Cold War alliances, which are the focus of Menon's book, a *Choice* Outstanding Academic Title for 2007.

Menon is convinced that "tectonic movements" in American

Rajan Menon, professor of international relations, says foreign policy can no longer be tied to Cold War theory and practice.



grand strategy lie ahead, even though they may seem implausible now and will surely be resisted by a foreign policy establishment that remains institutionally and intellectually tied to Cold War theory and practice.

What he foresees is a subtle and slow shift from alliances to “alignments,” which he describes as a “supple and creative mode of statecraft.” The new strategy should be one that balances realism with principle and rests on a hardheaded awareness of real threats to American security, combined with a commitment to address global problems ranging from poverty to pollution.

“We should reduce our dependence on foreign oil as a way to reduce our profile in the Middle East and our dependence on unsavory regimes,” says Menon, who advocates a focus on reducing global poverty along with an assemblage of states—including oil-rich Arab states—and organizations such as corporations, international organizations, and nongovernmental organizations.

He also advocates quick intervention to offer disaster relief with other willing superpowers, as well as a nuanced policy toward a rising China that is “judicious and subtle, not alarmist and ideologically driven.”

History

A past without history

The first postwar Jewish orphanage established under the auspices of the Central Committee of Polish Jews in central Poland was officially opened in March 1945 in Otwock, a town near Warsaw. This orphanage became “home” to 130 Jewish orphans who survived the war in Nazi-occupied Poland and in the depths of the Soviet Union.

For Joanna Beata Michlic, the children who inhabited this Children’s Home between 1945 and 1949, the surviving members of their families, and the Home’s staff



Four children of the Jewish Home for Children in Otwock: Wladek Kornblum, Linka Sztarkman, Renia Kucyk and Jakub Buchman.

The children of the Jewish Home for Children in Otwock in 1946.

represent a microcosm of the remaining world of Polish Jews. Michlic is analyzing written and videotaped testimonies of these survivors, along with other historical data, to reconstruct the post-1945 social history of East European Jewish society.

Michlic, associate professor of history and the Helene and Allen Apter Chair in Holocaust and Ethical Values, explores Jewish childhood and family, which until quite recently has been considered an area without history. She says documenting the lives of these orphans is vital to understanding crucial aspects of post-1945 social history and memory of East European Jewish society.

“Some of these children had upper middle class urban backgrounds and were offspring of well-known prewar Jewish Socialist activists, whereas other children came from much more modest social backgrounds. The so-called ‘luggage children’ (babies and toddlers thrown in suitcases by their parents from trains heading for death camps) did not know at all their



PHOTOS COURTESY OF TAMARA WEINREICH AND LINKA AND DOV (WLADEN) KORNBLUM

biological parents and the dates and places of their birth,” says Michlic. “The majority of those who survived the war in the Soviet Union were exposed to some Jewish traditions and education throughout the war, whereas many younger children who survived the war in Nazi Germany-occupied Poland forgot or were not aware of their Jewish identity.”

Michlic sifts through records at various archives in Poland, Israel, and the United States, including the Shoah Foundation Archives in California, and conducts interviews with former child survivors in order to explore various accounts of how Jewish children in Poland remembered the war and experienced life in the immediate postwar years. She analyses child survivor testi-

monies written in Polish, Yiddish, Hebrew, and Russian that were taken during the early postwar period, and oral histories taken with the same children after they had grown to adulthood.

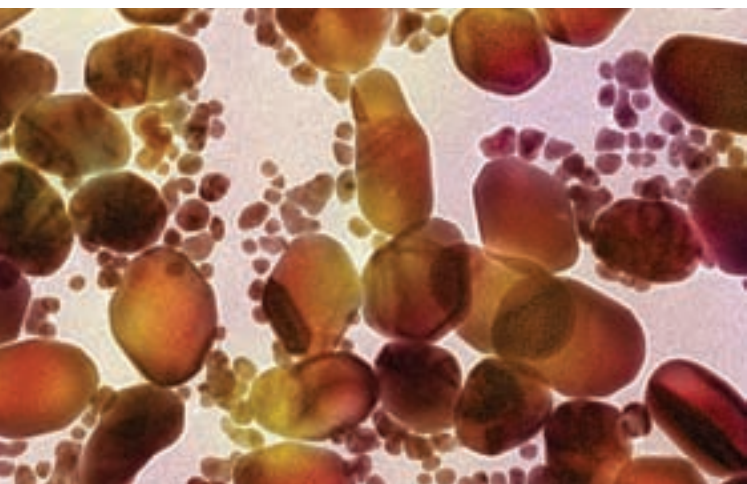
“This study will enhance our understanding of the complexities of a transition from an almost destroyed Jewish community to a community aiming at self-restoration, in which the surviving Jewish children are perceived as central and indispensable to revival,” she says. “It also reminds us that writing history can be deeply immersed in the lives of ordinary living people and that can constitute a fascinating, poignant story of how the past shapes the present, and how personal memory interacts with public memory of the past.”

Chemistry

Gold shines on the nano-scale

Gold is typically considered chemically inactive, which is why it's most often recognized as a material for jewelry and coinage. But over the last 20 years, it's becoming increasingly clear that by shrinking gold to the nano-scale, the material possesses powerful catalytic potential for important chemical reactions.

David Moore, assistant professor of chemistry, investigates the catalytic properties of gold nanoparticles (NPs). Moore and his group are



DAVID MCCARTHY / PHOTO RESEARCHERS, INC.



DONIGLAS BENEDET

David Moore, assistant professor of chemistry, investigates the catalytic properties of gold nanoparticles (above).

working to develop a new technique dubbed "freeze-frame spectroscopy," whereby a cryogenic matrix, such as solid argon or liquid helium nanodroplets, is used to trap complexes of NPs and reactant molecules in catalytically relevant structures.

"The key point here is that these complexes are often very weakly bound and thus are transient species under normal reaction conditions, making them very difficult to study by more conventional means," says Moore. "The low temperatures of the matrices—10 Kelvin and below—allow us to stabilize these systems so that we can study them."

Researchers employ vibrational spectroscopy to take a "snapshot"

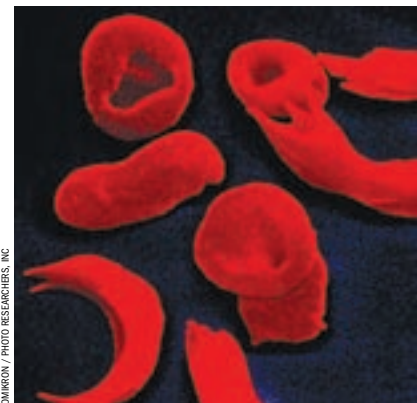
of these pre-reactive complexes, which are compared against predictions from theoretical computations in order to assign molecular structure. The ultimate goal is to use the resulting data to extract information about the mechanisms of the associated chemical reactions.

To vet the technique, Moore tested the catalytic oxidation of carbon monoxide (CO) on gold NPs. This application has received intense focus recently, since CO is a potent "poison" of other catalytic reactions, such as those in hydrogen fuel cells.

"It has been known for more than 20 years that small gold nanoparticles, supported on metal oxide support materials, are potent catalysts for CO oxidation; however, the precise mechanism is still under debate in the literature," says Moore. "We hope to provide some new insights via model experiments employing freeze-frame spectroscopy under carefully controlled conditions."

Moore's technique allows for narrow control of the size of pure gold NPs, as well as their electric charges. The initial goal is to build up a database of spectra for these model systems over a wide size range, and then compare these with results of cryogenic experiments on actual supported gold-NP catalyst materials in order to identify active sites and reaction intermediates.

Although Moore's work focuses initially on gold, he believes the freeze-frame spectroscopy approach is general enough that he will be able to rapidly broaden the scope of his research. "Catalysis applications involving nanoparticles are attracting a lot of interest right now, and we want to get in on the action early," says Moore. "I would like for the 'big picture' focus of our research to be on alternative energy sources, and hydrogen storage and artificial photosynthesis are other areas where we think we might be able to make a contribution."



OMIKRON / PHOTO RESEARCHERS, INC.

Protein aggregates in sickle cell anemia when, over time, hemoglobin molecules nucleate and form polymer chains.

Physics

Structure divulges proteins' role

Globular proteins lie at the core of cellular function and biological processes, and many human diseases are caused when they malfunction. But in order for scientists to understand the function of these proteins, they must first determine their structure, yet little is known about the latter.

James D. Gunton, the Joseph A. Waldschmitt professor of physics, is looking to gain insight into the complex structure of these proteins by investigating the nucleation and growth of crystals of globular proteins from homogeneous protein solutions. By determining the protein's molecular structure, scientists can better understand the role of these important proteins—including common globular proteins such as hemoglobin, myoglobin, insulin, serum globulins in blood, and many enzymes. To do so, scientists typically use X-ray crystallography—a difficult process of growing high-quality crystals from aqueous solutions of proteins.

Gunton uses theoretical models and simulation to understand the optimal conditions for crystal nucleation by determining the phase

diagrams and nucleation rates for various models of globular proteins in solution, including both continuum phase field models and microscopic models of systems with short-range attractive forces. The subject is thriving, as several types of phases can occur, in addition to crystallization; the large number of different kinetic pathways to crystallization poses an obstacle to the experimentalist. The optimal path to phase separation is the formation of protein-rich liquid droplets in a background of protein-poor liquid. It has been shown that the existence of this liquid phase separation can enhance crystal nucleation, although the precise method by which this occurs has not yet been determined.

These protein phase transitions are of particular interest to Gunton, since certain diseases can occur when proteins aggregate in humans when they should not. Studying protein aggregation, a process in which disordered clusters of protein form in solution, becomes vital. For example, there are families of proteins in the fluid of the eye that are responsible for the eye's transparency and sickle cell anemia. One family of proteins, called gamma crystalline, have a weak attraction between each other. Research has shown that, as humans age and the condition of their eyes change, the gamma crystallines begin to aggregate. His work is shedding light on the phase transitions that take place when these proteins aggregate. Aggregation also occurs in sickle cell anemia when, over time, hemoglobin molecules nucleate and form polymer chains. As these chains continue to form, more molecules bond to the sides of the chain, creating fibers. These fibers distend the cell and make it more rigid, creating the sickle shape and making it impossible for hemoglobin to move through the circulatory system.

It turns out that this is a nonequilibrium phase transition,

and Gunton and his graduate students have developed a model to describe the particular type of phase transition people had seen for hemoglobin that involves water. Water plays a crucial role and affects the type of phase transition these hemoglobin undergo. He and his colleagues have been trying to improve this model with the long-term goal of predicting the protein nucleation rate. This will ultimately permit scientists to avoid or slow down the undesired nucleation and prevent the onset of the disease.

Mathematics

Pictures by the numbers

It's a simple question. Which of these numbers is larger than the other?

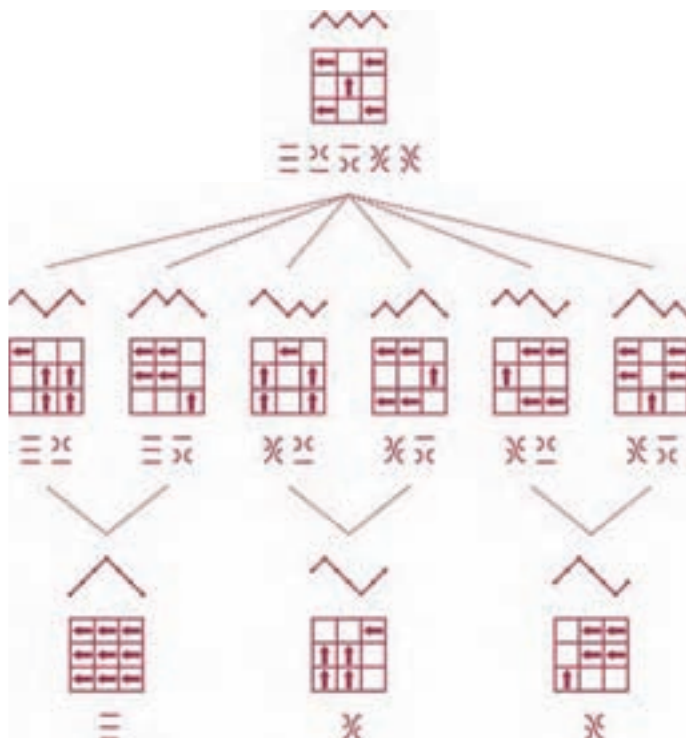
Mark Skandera, assistant professor of mathematics, is trying to explain such inequalities arising in the areas of total nonnegativity, symmetric functions, and polynomials with real zeros. He is studying prod-



Mark Skandera, assistant professor of mathematics, studies products of determinants in matrices.

ucts of determinants in matrices, and which products are larger than others.

A determinant is a real number which is calculated from a matrix. This number can determine whether a set of linear equations is solvable. A matrix is a rectangular table



This illustration shows the relationships that exist among products of minors of totally nonnegative matrices.

of elements which may be any quantity that can be added and multiplied. Matrices are used to describe linear equations.

Determinants of matrices three or four rows wide by three or four rows deep can be calculated by hand, but those of larger matrices have equations that are very long and require a computer to calculate. Working with these determinants to prove something in general can be cumbersome, but Swedish mathematician Bernt Lindström determined that matrices are more easily understood when associated with pictures. By using these pictorial representations of the equations, mathematicians can replace the large formula with the idea it represents.

Using Lindström's method, Skandera puts Xs and Os in certain positions within a square matrix, and then he applies simple rules to where these positions are. From this, he can create a picture of minors, determinants produced by removing one or more of its rows or columns, to demonstrate determinant relationships.

"We can determine which determinant is bigger than another by

moving around the Xs and Os. We're deciding what is bigger than what. It boils down to playing with the pieces, like moving pieces on a chess board, to develop a picture. You can build these ideas better with pictures that you can have in your head."

Skandera's work develops models that have applications in fields such as engineering, chemistry, and physics. His work has particular application to the inverse scattering method, which determines the characteristics of an object from measurement data of radiation or particles scattered from the object. In order to apply this method, researchers need to solve a large number of equations and use algorithms to generate elements of some complicated algebra.

"If we assume we've done all that, then we can use the inverse scattering method. The problem is that computation of certain quantities within the algorithm is quite cumbersome. Nobody knows a simple way of computing these things," says Skandera. "I'm tapping away at it by developing appropriate pictures to see if I can take all of the equations out of the equation."

CONSTRUCTING A



Earth's climate is changing. Temperatures are rising due to increasing levels of greenhouse gasses. It is projected that droughts, floods, and other extreme weather will become more frequent. Sea levels are rising and research indicates they will continue to do so, forcing hundreds of thousands of people in coastal zones to migrate and communities to change as a reflection.

By Joseph P. Ferry

On Feb. 2, 2007, a United Nations scientific panel studying climate change acknowledged that the evidence of a warming trend is clearly identifiable, and that human activity has very likely been the driving force in that change over the last 50 years. While media pundits and policy makers debate environmental threats and focus on recent history, scientists are examining climate change and its effects on ecosystems over much longer periods. Lehigh faculty members study environmental change at all scales, examining centuries

of climatic change to provide the needed tools to address current environmental issues and their impacts on today's communities.

Some evidence of these changes is archived in the Earth, and paleoclimatologist and paleoecologist Zicheng Yu studies climate and ecological changes over the last 10,000 years so he can link modern processes to the record of environmental change. He uses multiple proxy data to study the dynamics of vegetation, climate, hydrology, and carbon cycling. By using paleoecological records including pollen, conifer stomata, and plant microfossils, he is able to reconstruct past flora and vegetation changes and analyze environmental influences.

An associate professor of earth and environmental sciences, Yu's work has taken him to Alaska, Canada, and western China in search of evidence of past climate change and how it might help us understand and predict future climate patterns and ecological impacts. By looking at different parameters in the sediment, he is able to draw fairly reliable conclusions about the climate changes that have taken place in the arid and semi-arid area of western China.

"There have been major changes in the moisture conditions over the last several thousand years," says Yu.

These changes include shifts between grassland and desert vegetation and between fresh and saline lakes. Most of the change has to do with monsoon circulation, either directly or through mediation by the complex regional topography, he says. Monsoons, which respond

CLIMATE FOR CHANGE



JONATHAN BLAIR/NATIONAL GEOGRAPHIC/GETTY IMAGES, CHARLES O'REAR/CORBIS, ATLANTIDE PHOTOTRAVEL/CORBIS, DAVID J PHILLIP POOL/GETTY IMAGES

to solar radiation, were more severe 10,000 years ago, because of strong summer insolation in the Northern Hemisphere, rather than the last few thousand years.

In Alaska, Yu has been studying climate change and ecosystem responses by examining core samples taken from peatlands, as part of a collaborative project on global peatland carbon modeling and analysis sponsored by a four-year National Science Foundation (NSF) grant. Along with colleagues from the University of New Hampshire and UCLA, Yu wants to see how carbon accumulation has responded to climate change—and vice versa—over the same time frame.

Peatlands are important because while they cover only a small percentage of the total land surface of the earth, they account for about one-third of the total soil carbon in the world. In North America, peatlands are the single largest carbon reservoir of any ecosystem, yet peatland functioning and future behavior are not well understood.

Yu has seen interesting results. He found that Alaskan peat rapidly accumulated about 11,000 years ago until about 9,000 years ago, at a time when temperatures were higher and the climate drier. This suggests that the production and decomposition processes of these ecosystems might have responded differently to climate change in the past. Together with colleagues at Lehigh, Yu plans to document temporal and spatial changes in peatland carbon accumulation and peatland expansion in the last 30 years and 1,000 years to understand the processes and connection between peatland and

ongoing changes in climate and hydrology. He also plans to evaluate the role of peatlands in future regional and global carbon and water balances.

The research is critical because over the last century, average air temperatures at high latitudes have increased at a rate more than double the global average, leading to widespread melting of mountain glaciers and permafrost. There are concerns that the contributions in Alaska of mountain glacier melting to sea-level rise were previously underestimated, due to temporary water storage in expanding peatlands. The insights gained from the study will be applicable to other regions in Alaska and in other high-latitude regions that have experienced similar climatic, hydrological, and ecological changes. It will also help in understanding the connections between climate change, glacier dynamics, hydrology and ecosystems.

Adapting to extreme weather

Yu's observations are not unique. His colleague, Bob Booth, studies the ecological dynamics associated with widespread drought and flooding events of the last several thousand years.

"The delineation of continental-scale patterns of moisture anomalies can tell you a lot about the underlying atmospheric circulation patterns," he says.

One of the most serious challenges society faces in response to climate change is adapting to alterations in extreme weather events. Booth's work is composed of

"The delineation of continental-scale patterns of moisture anomalies can tell you a lot about the underlying atmospheric circulation patterns."

“There is no reason development cannot co-exist with functioning ecosystems. But because of antiquated policies, and decisions about land use made within localized and sometimes politicized jurisdictions, it is not generally being done that way.”



two components: building a large geographic network of peatland records to map out moisture anomalies through time, and understanding how ecosystems responded to past fluctuations in water balance. An assistant professor of earth and environmental sciences, he is focusing on the Medieval Warm Period, also known as the Medieval Climate Anomaly. Stretching from about the 10th to the 14th century, it was a time when the Northern Hemisphere was relatively warm and the North American climate was characterized by a series of large and long, multidecadal-scale droughts.

These droughts have been well documented in the tree-ring records of the western United States. However, tree-ring records are less useful in more humid regions, where the effects of other factors on tree growth, such as temperature and competition, confound interpretation.

Using peatland and other records in conjunction with the tree-ring records of the West, researchers like Booth are beginning to map out what actually happened on a continental scale. It turns out these long droughts extended well into the Great Lakes and eastern North America. Although it is uncertain how far they reached, evidence suggests at least to upstate New York. Interestingly, these three or four monstrous droughts were interspersed with periods of exceptional moisture. “It was a period of high variability in terms of moisture, and this increased variability had profound effects on forest ecosystems,” says Booth.

Booth hopes that by understanding the dynamics and ecological impacts of these past droughts, scientists will have an idea of what can be anticipated with warmer temperatures. Ecosystem managers have been very concerned about the effects of drought in the arid and semi-arid West, but there has been virtually no concern about the impacts of drought on ecosystems in humid regions of the eastern U.S. In the last 100 years, droughts haven’t affected these systems, but drought had substantial ecological effects during the Medieval Climate Anomaly. A repeat of that anomaly would be unlike anything we’ve seen in the last century, he says.

“It definitely raises red flags that we should be thinking about how these systems might be impacted, especially given that warming temperatures are expected to lead to more frequent and intense droughts in many mid-latitude regions.”

Re-examining public policy

With the northern 38th parallel bisecting the continental U.S., climate change requires re-examinations of public policy, says Breena Holland, an assistant professor of political science. Public policies inevitably distribute environmental benefits and burdens. Unfortunately, the overall impact of the benefits and burdens is often overlooked because policy analysis generally focuses only on understanding a policy’s net short-term economic impact. To broaden this analysis



PAUL SOUDERS/CORBIS, ANTHONY REDPATH/CORBIS, NASA/CORBIS

to account for the full range of a policy's impact raises questions about equity and justice.

Analyzing government policy, she identifies how societies can address global concerns about the environment through domestic policy. Holland argues that ecosystem change will be more devastating for poor people in underdeveloped countries, because a majority of those at risk from climate change already lack the resources and services that make human well-being possible. Holland is examining the methods of policy analysis and determining how the policy-development process can be improved.

"These are the most important political questions, and they compel us to consider what justice requires, and why a particular definition of justice calls for citizens to interact with the environment in one way rather than in other ways. Too many times, decisions that affect a community are made without the participation of that community," she says.

Current research conducted by Holland focuses on defining environmental justice and developing a broader theoretical framework to ensure it is reflected in policy decisions that are well reasoned and applicable in a wide range of circumstances.

A changing climate also impacts a variety of resources—including water, agriculture, and forests—and the economies they support. Holland is studying the underlying questions concerning how environmental resources should be valued and how policy decisions should be justified, and hopes to develop a

set of tools that decision makers can use to evaluate environmental impacts that go beyond easily quantifiable costs.

An example of the wide-ranging factors that must be considered in a land-use decision relates to the proposed Sands BethWorks Casino on the former Bethlehem Steel property in Lehigh's hometown of Bethlehem, Pa. The Sands BethWorks is part of a redevelopment plan in the wake of the closure of Bethlehem Steel, the nation's most prominent steel producer until 2003. While steel production produced its own environmental issues, traffic studies estimate the casino will add as many as 2 million cars to the streets and highways in and around the city.

But there is already a problem with asthma in the area—upward of 40 percent of youngsters in some local public schools suffer from the disease. The region has been out of compliance with the Environmental Protection Agency's previous eight-hour ozone standard. Despite the state's recent efforts to bring the region into compliance, Pennsylvania Department of Environmental Protection records show the state has not maintained reductions that are below the new eight-hour ozone level limits, which dropped the acceptable level of ozone from 85 ppb (parts per billion) to 75 ppb.

On one hand, there is the need for economic development. On the other hand, 2 million more vehicles will exacerbate an already serious problem with air quality.

"How we look at that and come up with a solution will be significant," says Holland. "We need a systematic and broad way to come up with better solutions—solutions that are economically efficient, but also fair to those who bear the environmental burden of increased pollution."

Finding solutions

It's an argument that strikes a chord with Dork Sahagian, professor of earth and environmental sciences and director of Lehigh's Environmental Initiative. Sahagian argues that economic development and environmental protection are not mutually exclusive. Pitting one against the other is polarizing and sets up a false division that is not productive. Smart growth solutions provide for economic development while protecting habitat and creating healthy communities.

"There is no reason development cannot co-exist with functioning ecosystems. But because of antiquated policies, and decisions about land use made within localized and sometimes politicized jurisdictions, it is not generally being done that way," says Sahagian.

According to some ecological economists, the economic value of goods and services provided by the Earth's oceans, forests, grasslands, wetlands, lakes and rivers is about \$33 trillion annually. By establishing a business case for the natural environment, he hopes that the cultural rifts separating scientists, politicians, and citizens can be bridged. In an arena where policy decisions are based on community values and quantitative risks, science must be translated for subjective application, he says.

For Sahagian, suburban growth not only means the possible loss of wetlands and the disruption of wildlife migration routes, but also more car miles and gasoline consumption, increased flooding risks for downstream communities, and even permanent loss of economically vital natural resources. He is a strong proponent of Smart Growth, a highly interdisciplinary approach that argues that development is acceptable—and necessary. But it stipulates that it must be done in an organized and coordinated way and doesn't disrupt the ecosystem that is responsible for many of the goods and services that are provided for free, and upon which, a large part of the economic development is based.

Protection of wetlands provides a good example. People move to the countryside for the scenic beauty, but if everyone moves to the country it's not scenic anymore, he says. "Beauty is the least of the goods and services we should care about. Partitioning and biogeochemical cycling of wastes in wetlands shows the high value of wetlands. They do a lot for us to filter and keep the ecosystem clean, which is why they are so carefully protected."

In many cases, people have turned the suburbs into a desert by planting non-native ornamental trees and bushes—such as the popular Japanese Maples and bamboo. Unfortunately, these plants make unappealing meals, forcing the indigenous insects to go elsewhere, along with animals such as birds that feed on insects, thus ultimately affecting the entire ecosystem.

There are also tough geographic issues to consider, says Sahagian. Solutions come by looking at the needs of natural areas in terms of ecosystem function, by preserving migration patterns, the movement of biogeochemical elements, and nitrogen and carbon cycling. The bottom line is: How does the built area impact the sustainability of the ecosystem upon which we ultimately depend? Finding the answer involves looking at the situation from several viewpoints, including science, technology, and society.

In addition to examining these urban issues, Sahagian has been working with the International Geosphere Biosphere Programme and the NSF to develop the



PHOTO: MICHAEL MCJANNET, XAVIER BERTIN/EPA/CORBIS

Earth System Atlas, a Lehigh-based tool that will compile and analyze data pertaining to Earth systems. The Atlas will provide the first venue for peer review of Earth system data sets and publication of data for the broader community. Maps will be created from ground-based and satellite-derived data, conceptual and numerical models, and census and additional relevant databases. Users can develop maps in such a way that different data sets can be compared and combined. Past conditions may be compared visually with the present and also with future environmental conditions predicted on the basis of current models and scenarios driven by human activity.

Science should help communities and governments develop policies addressing climate change, says Sahagian. For example, it may not be wise to build new infrastructure in coastal areas that may be inundated with rising waters, he said. "Coastal management schemes need to be developed to account for sea level rise, but it is difficult to allow natural coastal processes such as overwash of barrier islands to proceed when private property is at stake," says Sahagian.

Urban growth will require a genuine commitment to new forms of collaboration among academics, policymakers, citizens, and the variety of organizations that are working to address environmental problems.

"How we look at that and come up with a solution will be significant," adds Holland. "The work we're doing is trying to figure out a systematic and broad way to come up with better sustainable solutions." ●



EARTH FROM ALL ANGLES

When faced with significant questions about the environment, one might not think to seek counsel from an expert in education, international relations, economics, or Buddhist studies. But the contributions of researchers in these fields are as crucial to understanding our environmental challenges as that of researchers in the natural sciences. The answers that spring from collaborative discussions across these disciplines might provide the best hope for improving and sustaining our natural world.

This is the philosophy of Lehigh's Environmental Initiative, a broad interdisciplinary program of research, education, and outreach.

Rather than working in academic silos, researchers across all four of Lehigh's colleges are collaborating to address the full spectrum of environmental problems facing today's society. By integrating environmental activities in science, engineering, politics and policy, communication, history, anthropology, sociology, economics, ethics, education, and other traditional disciplines, experts are able to tackle issues of the environment from all angles.

"When all of the disciplines relate how they impact or are impacted by the environment, only then will we be able to address the pressing environmental problems we will face in the coming years," says Dork Sahagian, director of the Environmental Initiative.

A recent Toyota USA Foundation grant awarded to members of the Environmental Initiative is indicative of how this interdisciplinary approach works to promote just one area of

need—environmental literacy. The grant will fund the creation of professional development materials for teachers, as well as update science curriculum using a package of innovative instructional technologies.

"We've gone through years—almost a full generation—without significantly changing our country's science curriculum to reflect the global issues our society is facing," says Alec Bodzin, associate professor of teaching, learning, and technology with the College of Education and lead principal investigator of the grant.

Bodzin has teamed with earth and environmental sciences professors Sahagian and Dave Anastasio, co-PIs of the grant, whose expertise in environmental change and structural geology, respectively, bolsters Bodzin's work in the field of education.

Issues like environmental literacy begin to unite faculty members whose disciplines might not otherwise allow them to cross paths.

It also encourages faculty like Kenneth Kraft, professor of religion studies, to examine Buddhism's intellectual, ethical, and spiritual qualities in light of contemporary environmental problems; or Todd Watkins, associate professor of economics, to help nonprofit organizations through social entrepreneurship; or Kristen Jellison, assistant professor of civil and environmental engineering, to find ways to better prevent waterborne disease through both improved water treatment and also a thorough understanding of the environmental sources, fate, and transport of microbial pathogens.

"We've gone through years—almost a full generation—without significantly changing our country's science curriculum to reflect the global issues our society is facing."



Promise Land

It was a vast stretch of land on one side of the Atlantic. To Native Americans, it was a home where many cultures flourished. To Europeans, it was an uncharted wilderness called America. It was a land of promise, a land of possibility, and in the 18th century, it began to transform into the country it is today.

The study of 18th-century America is critical in understanding the foundations for much of what has become the fabric of the United States of America. Political thought, religion, sources of power, gender roles, culture, and identity can be traced in great part to developments shaped during these 100 years of movement and growth. At Lehigh, faculty from across disciplines focus on these aspects of the 18th century to gain a better understanding of where we came from and perhaps where we're headed.

"The 18th century is an exciting and transformative era for politics, economics, family life, and race," says Monica Najar, associate professor of history. "One of the reasons it's exciting is that it's this transition to the modern world, which allows us to see the foundations of that which we take for granted."

For Rick Matthews, NEH professor and chair of the political science department, insight into the past, in some cases, helps make sense of the present.

Highly contested issues during that century still arise in today's political landscape. Separation of church and state, for example, was critical in the eyes of James Madison and Thomas Jefferson, who were apprehensive of the power of religion, especially when combined with politics.

Matthews researches the philosophic foundation of our political system, and has spent years trying to understand some of the American founders. As a historian of political thought, he combs through thousands of



By Tricia Long

documents—state papers, letters, essays, and speeches—in an attempt to determine what their political theory would have looked like if they had had time to write one. Digging through massive volumes of writings penned by Madison, Jefferson and Alexander Hamilton, Matthews begins to find commonalities, divergences, and themes that shed light on what motivated them, what moved them, and what mattered to them.

"These three founders had a sense that they were doing great things. It was a radical departure from the Old World," says Matthews. "Reading them, you can tell that revolutionary

ideas are in the air. They wanted to create a *novus ordo seclorum*, a new secular order."

Jefferson's letters alone fill more than 70 volumes—from formal correspondence between founders debating the developing government to personal notes between friends and family. And through a collective reading comes a sense of what sparked this nation's earliest beginnings. From views on property, to the concept of what is human, to thoughts on government and law, these founders formed strong opinions. But more often than not, their opinions were not shared by everyone.

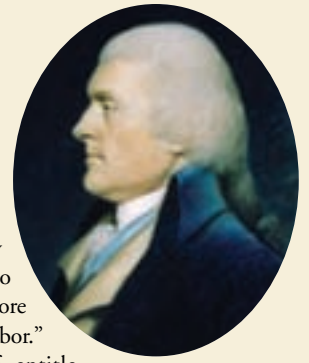
"It is a conventional myth that all founders thought alike," says Matthews. Oftentimes they were at odds over politics, religion, and power. Hamilton and Jefferson were optimistic, while Madison was pessimistic. They had fundamentally different ways of interpreting the Constitution. Hamilton eventually was viewed as an "archenemy" by both Jefferson and Madison.

In analyzing these volumes, Matthews discovered that Jefferson believed human society could exist without a government and that anarchism was a possibility amid the right conditions. Hamilton, an originator of an abolitionist society, had a remarkable rise to power after growing up an orphan in the West Indies and becoming first an aide to General George Washington, then Secretary of the Treasury under President George Washington.

"The 18th century in itself is a myth," says Matthews. "The roots are two to three centuries

...deficit in their ...
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...at this moment for the 1787, 1787 is on their
...I cannot write these things in a public dispatch
...of some sort should be made in December of
...I am with sentiments of the most perfect esteem & ...

The Thomas Jefferson Papers, the largest collection of original Jefferson documents in the world, includes correspondence such as this Account of Funds Owed by James Madison (below) to Jefferson (right) from August 2, 1787.



At the twilight of their place in the empire, while battling the French and the Native Americans, their British loyalty shined. “We conceived ourselves as British American,” says Matthews. “There was no loyalty to the United States of America.”

But lacking the rights of British citizens, their sense of loyalty began to waver, and the 18th century, Najar says, laid the early groundwork for an American identity.

Geography began to shape an early sense of American nationalism. Literature such as Washington Irving’s *Rip Van Winkle* and *The Legend of Sleepy Hollow* became infused with a new sense of American character, and could only have been written in the landscape of this new world. People began to embrace the wilderness and decry cities and civilizations as European.

Najar, author of *Evangelizing the South*, also believes religion was a way of finding a space in the world. “Religion had primacy. The first question you would ask is, how do I act as a Christian, and the rest will follow. Religion in the 18th century becomes part of the way Americans see themselves as special.”

Transformative moments and religious revivals transpired across colonial and denominational boundaries. Religious identity had an extraordinary role in the 18th century, as America’s specialness, people presumed, was happening at the hand of

myopic. People came to think they had more right to the land and more right to people’s labor.”

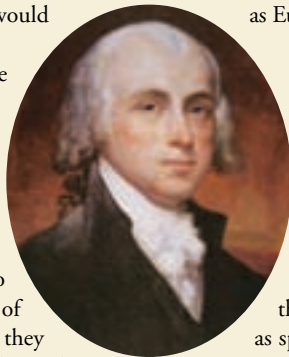
This sense of entitlement is most clearly seen in the 18th century when examining Native-white relations, an area of research for Michelle LeMaster, assistant professor of history and historian of colonial British America.

While meticulous care was kept in preserving the records of the likes of Hamilton, Jefferson, and Madison, Native American-produced written records from this century are non-existent. LeMaster must rely on English and French written documents—and all the bias that comes with it. She reconstructs patterns of Native American behavior by examining transcripts of travel accounts, governor’s letters, diplomatic talks, and speeches—records that most closely capture the tone and texture of the Native American life in 18th-century America.

LeMaster focuses on Native American tribes of the South, which retained much of their power during the 18th century. Despite the defeat of tribes in Virginia and New England at the end of the 17th century, tribes in the South used their diplomacy, size, and power to keep the English and their ideals at bay. This allows her to investigate how both the English and the Native Americans adapted to the presence of the other and created a working system of diplomacy.

The role of gender in shaping cross-cultural networks in areas of diplomacy, warfare, and trade is also an area of focus for LeMaster. She argues that ideas about proper roles for men and women in each culture informed the ways people approached foreign relations.

LeMaster has examined diplomatic missions through the lens of women, who rarely served



before and are in effect two to three centuries later. For the founders

this was an incredible experiment. Most would be surprised that we’re ruled by the same constitution. Jefferson would be appalled.”

Najar, a historian of the American revolutionary and early national eras, agrees. “There is something extraordinary about the people who lived in the 18th century in this country. Finding a cohort of people who think so creatively, who have a sense of their own empowerment—that they can change the world. They have the knowledge and the respect for knowledge, and can envision practical strategies to make things happen. Genius doesn’t always exist within one person, and so they built off of one another.”

“For the founders this was an incredible experiment. Most would be surprised that we’re ruled by the same constitution. Jefferson would be appalled.”

Even with this strong sense of empowerment, Najar is quick to note that people continued to struggle in trying to navigate their place in the world and find a sense of personal and national identity. Did this specialness come from being British or being American, they wondered.

God. This place, this landscape, was viewed as a special role in God’s providence, says Najar.

But this renewed sense of identity came with great consequences. “It’s dangerous to assume you are more special than other people,” says Najar. “It can be great and transformative, but it can be self-centered and

formally as diplomats, but shaped diplomacy in less obvious ways. “Looking at what the women are actually doing, they’re listening, remembering, consulting, giving their opinion, rattling out the guys when they get home, and exerting influence behind the scenes in their own family,” says LeMaster.

LETTER COURTESY OF THE LIBRARY OF CONGRESS

THE BRODEMAN ART LIBRARY / GETTY IMAGES

"Religion had a primacy. The first question you would ask is how do I act as a Christian, and the rest will follow."

For a new book, LeMaster is delving further into gender roles and gender influence in relationships between Native Americans and the English in South Carolina, North Carolina and Georgia. Native Americans and whites had vastly different understandings of gender roles and gender behaviors.

"What I found is that they spent a lot of time trying to find the things they had in common, and trying to use those as a basis for building a workable democratic relationship," says LeMaster. "In both societies, men are the political leaders, the diplomats, the religious leaders, and the warriors. These were all things they had in common so they'd try to build on that. But they'd end up running into problems where things weren't the same."

One area of divergence is farming—a job the English believed rested among men who were charged with providing for their families. But in Native American culture, women were traditionally the farmers, and the English expected men to adapt to their way of viewing gender responsibility. Women continued farming well into the 19th century, as Native American men attempted to maintain their familial stability despite pressure to change.

At that point, the English weren't strong enough to impose their notions of gender on the Native Americans.

"I'm looking at the way that gender roles were renegotiated within Native American communities to deal with the realities of

changing their gender roles."

For LeMaster, the study of white-Native American relations provides the opportunity to understand how people from completely different cultures try to relate to one another—and how relations can work or fail. When the

18th century came to a close, the English no longer needed the Native Americans—their protection, their diplomacy, their way of doing things. The English became more imperious, and the balance of power forever changed.

"By learning something about how this worked, we could learn something about how to deal with different people groups in the future and not repeat some of the same mistakes," says LeMaster. "We'll make new mistakes.

But we can learn something from the things the English did that ended up being detrimental that weren't really meant to be detrimental—selfish perhaps, but the damage done was not deliberate." ●



John Wesley (1703–91), evangelist and founder of the Methodist movement, preaches to Native Americans in Georgia in 1736.

things like the fur trade, and general contact with Europeans, and how that adversely affected women," says LeMaster. "The society did try to reorient itself in a way that made sense to native people without completely

A home for 18th-century studies

The Lawrence Henry Gipson Institute for Eighteenth-Century Studies brings together the diverse range of interdisciplinary research and expertise within the College of Arts and Sciences. Founded in 1972 in honor of Lehigh faculty member Lawrence Henry Gipson, the Gipson Institute supports research activities through an annual dissertation fellowship, which is awarded to a Lehigh Ph.D. candidate in any field of 18th-century studies, and provides research grants to Lehigh faculty and students involved in related projects.

"Lehigh University has such strong faculty in 18th-century studies," says co-director Scott Gordon. "There are few institutes around the country that are dedicated to this field."

Recent projects funded by the Gipson Institute include research on the suffering in English women's literature during the Romantic Era; the rise of evangelicalism in the American South; crime and punishment in 18th-century Pennsylvania; gender politics in coming-of-age novels in the Atlantic World; art and politics in the Trans-Atlantic world; and the impact of legal codes and culture on slavery in the French Carribean.

In addition, the Institute funds symposia and lectures by visiting scholars as well as publications. In fall 2009, the Gipson Institute will host The

American Society for Eighteenth-Century Studies' (ASECS) East Central conference. The ASECS supports work in all areas of scholarly inquiry pertinent to 18th-century studies.

"The Gipson Institute gives us a chance to encourage the study of the 18th century in so many ways," says co-director Monica Najar. "It's a chance to bring important scholars to campus to talk to students and meet faculty, and we award a variety of grants for use in classes and for individual students' research—all of which allow us to generate ideas, bring classes together, and spark discussion."

In addition, the Lehigh University Press has established a new series titled "Studies in 18th-Century America and the Atlantic World." Historically, the Press has focused on early America, local history, and science and technology in society. With the new series, the Press will build on that strength and will acquire, publish, and advertise titles that display the depth and breadth of the research and work conducted in the area of 18th-century America.

Several titles have already been acquired for the series, including a study of women's role in making a distinctive gentry culture in 18th-century Philadelphia, and a biography of Revolutionary War diplomat Thomas Barclay.





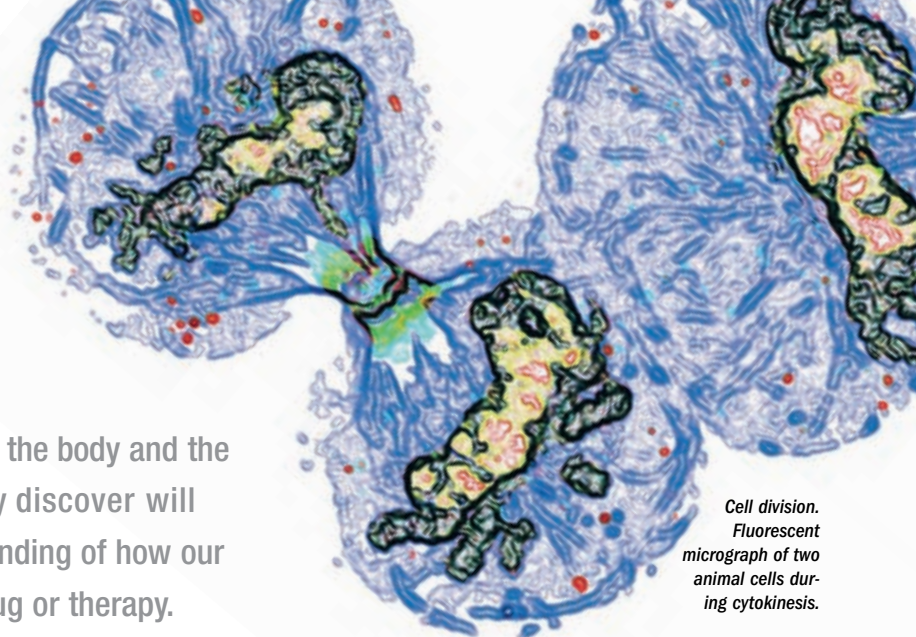
Feature

inner space

*Adherens junctions (E-cadherin, red),
actin filaments (green), and cell nuclei (blue)
in primary porcine endothelial cells (PAEC).*

Researchers are asking questions about the body and the cells that compose it. The answers they discover will eventually lead to a deeper understanding of how our bodies work and may lead to a new drug or therapy.

by rebecca straw



Cell division.
Fluorescent
micrograph of two
animal cells dur-
ing cytokinesis.

In Lehigh's Department of Biological Sciences, Kathy Iovine and Matthias Falk are investigating the role of gap junctions, intracellular channels that permit the free passage between the cells of ions and small molecules. Two channels, one on each cell, create a gap junction that allows neighboring cells to exchange signals.

It's a matter of too much, too little, and just right. To borrow from English poet Robert Southey, if Goldilocks were to select a coal-and-silver striped minnow from among the opaque tanks in the wing that houses biological sciences, she might say the trailing tails and fins on some

zebrafish were too long, while the stubby fins on others were too small. But some tanks contained zebrafish with fin lengths a happy medium, which Goldilocks would have called "just right."

Kathy Iovine, professor of biology, calls them "wild type" zebrafish.

Unlike the short- and long-finned fish, wild-type zebrafish have no obvious genetic mutations. Iovine studies both wild-type and mutant zebrafish to uncover the genetic and biological mechanisms fish, and other organisms, use to regulate size.

"I think size is so interesting, because it is intuitive but it is also something that is so prevalent that people don't really think about," she says.

Short-finned zebrafish carry a mutation on the gene that codes for connexin43, one of several proteins used to build gap junctions.

"It's not obvious to a lot of people why a mutation in the connexin protein would lead to defects in growth," Iovine says, "but it's clear that it happens."

Connexin proteins span the cell's membrane to form corresponding channels on neighboring cells that exchange signals but do not touch. Like gatekeepers to the cell, they regulate the passage of

molecules, ions, and other signals into the cell. A specific connexin protein will allow only select signals to enter the cell, while restricting others that might be permitted by different connexin proteins. In this way, the cell can control the type and quantity of signals it receives.

"We're finding that reduced levels of communication through connexin43 gap junctions actu-

ally lead to reduced levels of cell proliferation," says Iovine.

The disruption in signaling stunts fin growth by reducing cell division and by creating disproportionately short segments within the fin. This is a key piece of information, because mutations in the connexin43 gene also disrupt skeletal growth in humans, resulting in a rare genetic disease called oculodentodigital dysplasia,



DOUGLAS BENEDET

"It's not obvious to a lot of people why a mutation in the connexin protein would lead to defects in growth, but it's clear that it happens."

kathy iovine

which causes malformation of the facial skeleton and the fourth and fifth fingers. Mutations in other connexins can also lead to deafness, cataracts, skin problems, and neuropathies.

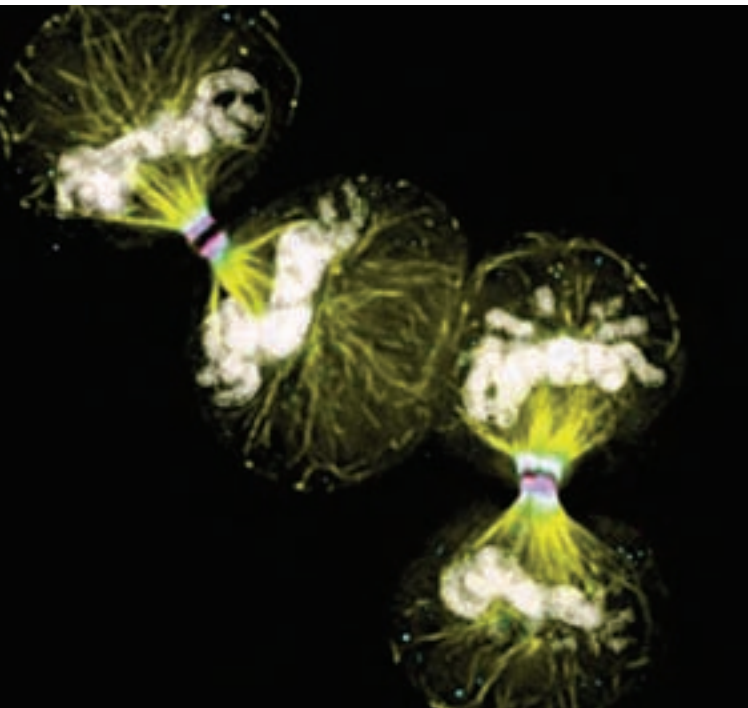
"It's worth exploring how mutations in this kind of protein can lead to diseases," Iovine says.

Falk, also an assistant professor of biological sciences, studies these same gap junctions and

Bony fin rays of the zebrafish
caudal fin stained with calcein.



KATHY IOVINE



DR. PAUL ANDREWS, UNIVERSITY OF DUNDEE/SCIENCE PHOTO LIBRARY

A fluorescent micrograph of two animal cells during cytokinesis, the final step of cell division. The contractile ring will eventually cleave the cell into two new daughter cells.

notes that while gap junctions allow direct cell-to-cell communication, there is mounting evidence that they actually play an important role in adhering cells to one another as well.

This is a particularly vital role for the cells that line the blood vessels, mouth, stomach, and intestines, Falk explains. Gap junctions and other cell-to-cell junctions seal the cells together, barring bacteria, viruses and other unwanted material from entering the body. If the seal fails, health problems ensue, which is why a misregulation in the number of gap junctions can potentially cause diseases, says Falk. When this happens, excess fluid could enter the lungs, causing pulmonary edema, or leak through the blood vessels as in hemorrhagic fevers.

However, a healthy cell must dismantle its gap junctions to migrate, divide, or regulate the flow of signals into the cell. Falk observes the mechanisms by which a cell removes its gap junctions through fluorescent light microscopy. Before a cell divides,



DOUGLAS BENEDICT

portions of the cell membrane containing gap junctions pinch inward forming small round vesicles—small sacs that transport substances such as waste—which will later be destroyed by the cell.

Falk discovered that the resulting vesicle contains two membranes—one from the cell that internalized it and one taken from the other cell. In the process of removing its own channels, the cell also removes and destroys its neighbor's corresponding channel and membrane.

After the gap and other cell-to-cell junctions are removed, the cell can divide.

During the final step of cell division, or cytokinesis, a ring of tiny, stiff fibers called microfilaments form around the cell's equator. The contractile ring constricts, like a belt tightening across a balloon, until it cleaves the cell into two new daughter cells.

"Cytokinesis is one of the most basic processes in cell biology; however, it's not clear how exactly internal cues determine where the ring forms or how it actually constricts," says Dimitrios Vavylonis, assistant professor of physics.

just before the cell splits, they move through the membrane to form the contractile ring.

Vavylonis believes the nodes migrate by creating microfilament links to other nodes. Myosin motors then use the microfilaments to drag the nodes closer together. However, if they were simply to pull together, the nodes would be clumped rather than spread in an even band around the yeast cell's center.



DR. PAUL ANDREWS, UNIVERSITY OF DUNDEE/SCIENCE PHOTO LIBRARY

A fluorescent micrograph of an animal cell during cytokinesis.

"What would help this is if these connections were dynamic, if they form and reform," Vavylonis says. The nodes connect, pull together, break their connections, and then

"A lot of chemotherapy is based on preventing cells from dividing. This may give insight for the making of a drug that prevents the division of certain cell types."

dimitrios vavylonis

Vavylonis examines the mechanisms governing a yeast cell's contracting ring. Myosin motors assemble within the cell's membrane in structures Vavylonis and his team call "nodes." In the early stages of cell division, these nodes are scattered haphazardly throughout the membrane, but

connect with other nodes. Since the links are formed at random, the nodes will not always be moving toward the equator, but overall they will migrate toward the center.

Vavylonis and his team work with physics professor Daniel Ou-Yang to design experiments that test whether the mechanisms

behind ring formation in animal cells resemble that of yeast.

“We used physical means to alter the cell’s mechanical condition externally and see how the cell responds internally,” Ou-Yang says.

Vavylonis speculates that this information may be useful to researchers hoping to stop cancer cells from multiplying. “A lot of chemotherapy is based on preventing cells from dividing,” he says. “This may give insight for the making of a drug that prevents the division of certain cell types.”

After division, each cell will have identical copies of DNA, the twisted ladderlike structure that stores genetic information. The pattern of nucleotide pairings that compose the ladder’s rungs, called base pairs, encodes for genes, which influence everything from a person’s eye color to their susceptibility to disease.

Dmitri Vezenov, assistant professor of chemistry, hopes to find a way of quickly and cheaply determining the pattern of bases. Although the Human Genome Project successfully sequenced human DNA, the project was long and costly, and

its process, called whole genome sequencing, is impractical for medical use.

“There is an enormous body of information constantly being generated by scientists about why you respond to drugs, why some people get cancer and others don’t, why some people are cured and others aren’t, or why some are responsive to medications and some are not. If only you can correlate this huge field of empirical data with very basic information—what the genomic property is—then it’s a huge step in health care for the nation. But given what it costs with the original human genome, it’s not possible,” says Vezenov.

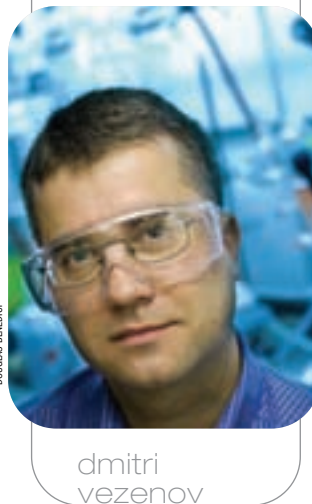
Vezenov and his team of researchers are pursuing the “\$1,000 genome dream”—a quest to sequence DNA for under \$1,000 funded by the National Institutes of Health. To do so, Vezenov uses DNA’s physical properties to discover the bases’ order.

“We’re going to use brute force. We’re going to go for speed and reduced expense,” he says.

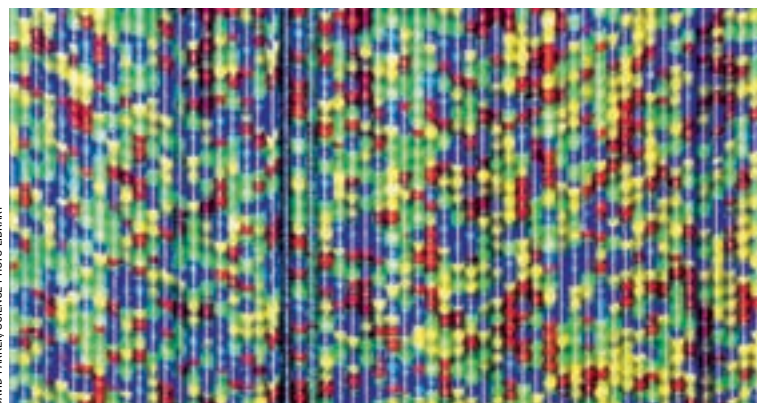
Vezenov cuts a single strand of DNA, half of DNA’s ladder, into smaller pieces and fixes one end of DNA segments on a grid. Then, he adds the bases—adenine, thymine, guanine, and cytosine—one at a time, to a single strand of DNA, until it becomes fully double-stranded. Because each base only matches one other base (in DNA, adenine only pairs with thymine and guanine with cytosine), the order of bases added to one strand of DNA reveals the order of bases on its complementary strand. As bases are added, the DNA fragment stiffens, because single-stranded DNA is more flexible and elastic than double-stranded.

“If one [strand of DNA] is like a rubber band, than two is a rigid rock,” he explains.

“There is an enormous body of information constantly being generated by scientists about why you respond to drugs, why some people get cancer and others don’t, why some people are cured and others aren’t, or why some are responsive to medications and some are not.”



DOUGLAS BERNDET



DAVID PARKER/SCIENCE PHOTO LIBRARY

A computer screen display of DNA sequencing pattern.

The team then measures the change in elasticity by attaching a fluorescent bead on the end of each DNA strand and uses a magnetic force to pull on the bead and stretch the DNA. In the presence of an evanescent light wave, the fluorescent bead glows brighter when the strand of DNA is most flexible.

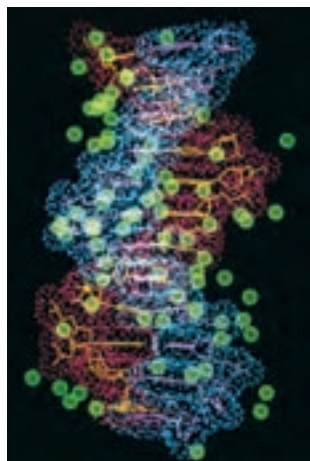
Next, they wash the grid, studded with thousands of DNA pieces, with a solution containing one of the four bases. If the base is the next one in the sequence, it is added to the growing strand of DNA. With each base addition, the DNA becomes a little less elastic, and the bead darkens. By measuring changes in the bead’s illumination, the team knows which DNA segment added the base.

The team cycles through the four bases until all of the single DNA strands double. Then, they use computers to compile the sequences into a complete genome.

So far, the team has proven that

the concept works on a molecule similar to DNA, and is now working with DNA. Regardless of whether the process works, Vezenov says the idea itself furthers research by suggesting that scientists could use the cell’s own mechanisms to reveal its genetic code. ●

A computer graphics image of DNA, showing its double helix structure. The green images are the associated water molecules.



OXFORD MOLECULAR BIOPHYSICS LABORATORY/SCIENCE PHOTO LIBRARY

A psychologist's quest to learn what motivates the human tendencies to think, feel or behave in ways that reflect concern for the well-being of others

Random Acts of Kindness?

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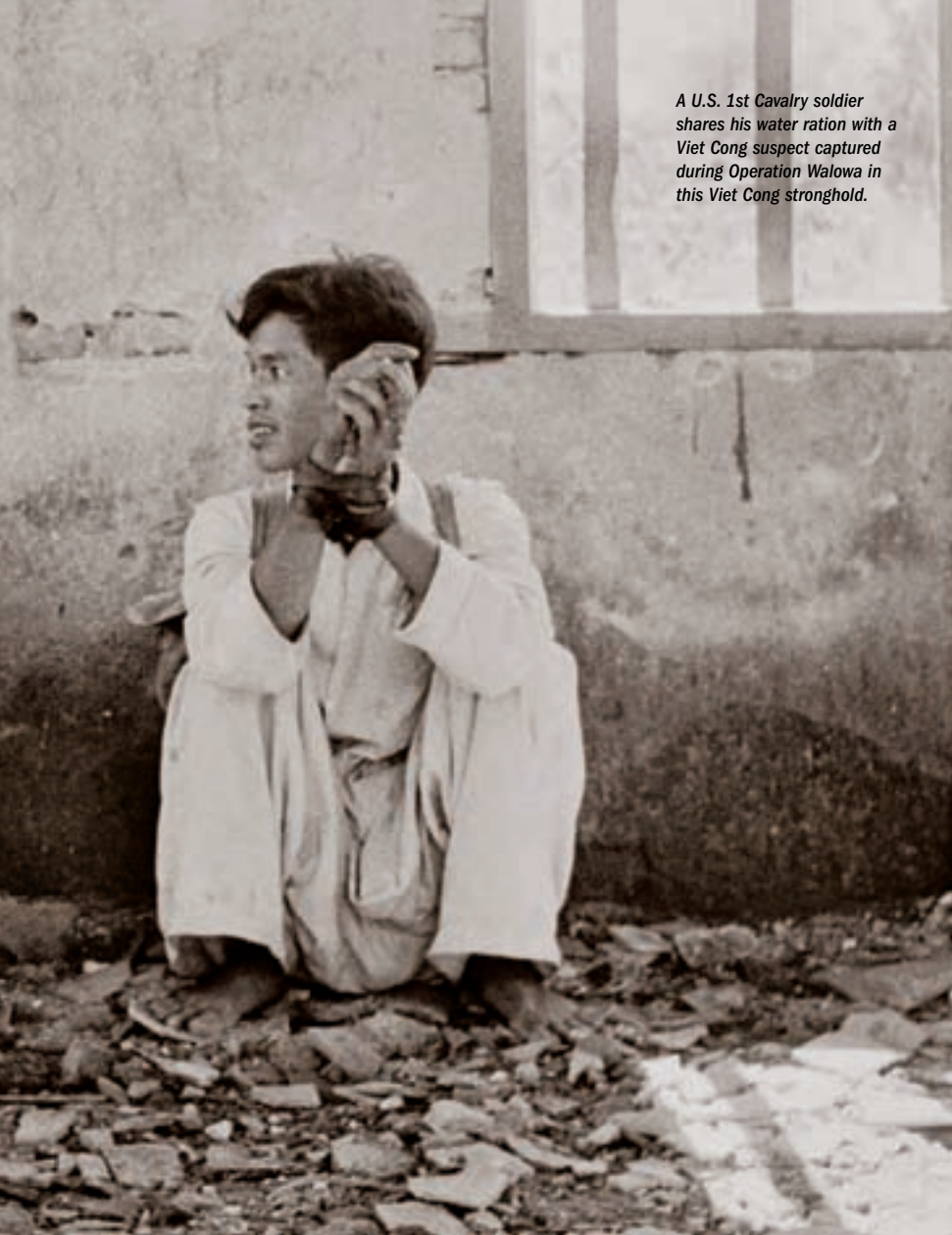
By LINDA HARBRECHT

A group of people hear the same story on the evening news: A militant group takes hostages and dozens of children are killed. Some viewers burn with rage and violent impulses, yearning for retribution. Others experience concern, refrain from impulsive blaming, and question the value of revenge.

Why, asks Michael Gill, do some people crave vengeance, where others seek to understand and remedy the diffuse causes that give rise to atrocities? For that matter, what motivates some to consistently act with kindness and compassion rather than hostility or apathy, or even reach out to total strangers across the globe?

Over the past decade, associate professor of psychology Gill, has been getting a better

A U.S. 1st Cavalry soldier shares his water ration with a Viet Cong suspect captured during Operation Walowa in this Viet Cong stronghold.



BETMANN/CORBIS

are stupid and lazy,” “they are like animals.” Contrast that, he says, with explanations offered by other people in which acts are viewed as dependent on external factors, influences outside of the individual or group. These external explanations can be incredibly diverse: “their culture does not expose them to alternative points of view,” “they grow up in an atmosphere of hopelessness,” or “they do not have the same access to social networks as others.” Such explanations imply that the individual or group is not thinking independently, but is instead influenced by factors outside its control.

In Gill’s research, this distinction between internal and external explanations has proven important for understanding prosociality.

For example, participants in one study provided open-ended explanations to questions regarding the social position of African Americans. In another, participants provided open-ended explanations regarding the violence of Arab terrorists. In both studies, trained judges coded participant explanations in terms of whether they focused on internal or external factors.

The studies indicated that, across these different groups, participants who called on external explanations were associated with more prosocial responses. These groups had warmer feelings toward African Americans and were more supportive of the value of diversity and had more misgivings about killing terrorists as the solution to terrorism.

In other studies, Gill manipulated explanations rather than measuring them, with similar results: Presenting people with information about external causes increases prosocial responses toward disadvantaged groups and groups that have committed atrocities.

Recently, Gill has moved beyond a focus on how people think about one particular group. Instead, he is exploring the possibility that people have social explanatory styles, or characteristic ways of explaining acts and outcomes across diverse individuals and groups.

His research suggests that people do have such styles: When asked to explain the positive and negative acts and outcomes of 16 unfamiliar individuals and groups, some people consistently pointed to external forces, whereas others consistently pointed to internal forces. Importantly, those with an

understanding of prosocial behavior, the voluntary behaviors intended to benefit and help others. Gill has been trying to decipher the code embedded within deeply entrenched cultural beliefs to better understand the psychological principles that govern prosocial thinking, knowing, emotion, and behavior. Stated more simply, what motivates the human tendencies to think, feel, or behave in ways that reflect concern for the well-being of others?

Gill notes that psychologists have identified several bases of prosociality. Perhaps the most emphasized is empathy: We can “put ourselves in another’s shoes” and experience someone else’s suffering almost as if it were our own. With that foundation, it is possible for some to understand the suffering of the impoverished, or those caught in war zones,

and the vicarious experience of this pain can inspire a prosocial response.

A second basis of prosociality is the embrace of moral principles that might be completely independent of vicarious feeling. Some might strictly adhere to rules such as “thou shalt not kill” or “give to the poor.”

Gill, who teaches both graduate and undergraduate courses on social psychology, social cognition, and theories of personality, seeks to understand social explanations, or the answers to questions such as: Why does that individual or group behave that way or experience those outcomes? His goal is to highlight novel variables—beyond empathy and moral principles—as bases of prosociality.

Gill’s research reveals that, when explaining the acts of others, some people point to seemingly internal factors: “they are evil,” “they

external explanatory style also scored higher on a measure tapping broad tendencies toward compassionate feelings.

Interestingly, this work also revealed that an external explanatory style was associated with a tendency toward thinking deeply and analytically. Gill interprets this as suggesting that, ironically, a compassionate heart can grow out of the analytic work of the rational mind. Synthesizing his work with that of others, Gill suggests prosociality has many distinct psychological bases, growing out of emotional processes (empathy), conformity to norms (moral principles), and also reasoning (social explanations).

Why prosociality?

Gill's devotion to understanding these forms of social behavior stems back to the 1990s, when he encountered the work of Thich Nhat Hanh, a Vietnamese Zen master who writes extensively on the topics of socially engaged Buddhism and compassion.

"My brother mailed me a copy of Nhat Hanh's book, *Being Peace*, which I read in one sitting," says Gill. "It was a powerful, inspiring



Zen Buddhist leader Thich Nhat Hanh walks during a procession at the opening of a three-day requiem in March 2007 for those killed on both sides of the Vietnam War.

experience and, over the years, his ideas have permeated my life, including my research."

Recognizing the Buddhist tenet that happiness stems from a life lived in accordance with our true nature, Hahn teaches that when we fail to lead lives that draw upon our more prosocial natural traits—compassion, empathy, need for connectedness—we are less happy and less hopeful. Gill recognized that his profession involved communicating an image of human nature through teaching and research. He wondered: What image of human nature is painted by my discipline? He decided that it is

not a flattering image: People are portrayed as selfish, competitive, prone to blame and hate.

"Of course, these negative portrayals contain some truth, but I think they are incomplete and likely to increase cynicism and unhappiness. So, in my work, I try to highlight positive potentials of human beings—sympathy, reconciliation, concern about others—to give a more complete understanding of human nature."

Crucially important to Gill is the concept that people are shaped by their view of human nature.

"We act based on whatever we think is 'natural' for human beings," he says. "And that raises significant issues, such as what does my discipline contribute to the image of human nature in the collective consciousness? So, I see myself as working on two levels. First, my research shows how social explanations contribute to prosociality. Second, at a broader level, my work reminds us that prosociality is part of human nature, providing a vision of human nature that can transform us into happier, more prosocial beings." ●



"In my work, I try to highlight positive potentials of human beings—sympathy, reconciliation, concern about others—to give a more complete understanding of human nature."



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The Lifeblood of a University

by Barbara Traister,
Associate Dean
for Research and
Graduate Programs

The range of research you see displayed in the previous pages makes clear what is distinctive about the College of Arts and Sciences. Work that stretches from translating ancient Chinese texts, to examining First Amendment rights, to working with gold nanoparticles demonstrates the range of investigation and discovery in which undergraduate and graduate students can become involved. In some ways, research and scholarship are the lifeblood of a university, moving it forward even as generations of students come and go and courses are taught, revised, and replaced. What keeps the curriculum fresh for each new wave of students is the

faculty's constant involvement in research. At a minimum, that means keeping abreast of the research done by others in their field and, as in the case of those faculty profiled here, it means providing leadership in the search for new knowledge, whether that new knowledge involves heightened understanding of globular protein functions, increased awareness of how stereotypes are formed, or the creation of a new poem. Faculty who are successful researchers enter their classrooms with excitement and confidence, knowing firsthand that the methods they teach and the background they provide their students lead to meaningful achievement.

One of the most satisfying parts of my job as Associate Dean for Graduate Programs and Research is meeting with each Ph.D. student at the moment he or she enters candidacy. At this point, each has completed coursework, passed the qualifying exams, formed a dissertation committee, and had a dissertation proposal approved. What remains is to complete the research and to write it up in the appropriate

form. I always ask students in this rather pro forma interview to tell me what they anticipate their work will add to human knowledge, and they respond with an extraordinary range of expectations large and small, some couched in terms of a team effort, others involving solo investigation. Their answers open a vast window from which to view the work going on in our college. Almost every candidate is excited, seeing this investigation on which he or she has launched as the high point of his or her educational experience. From many, I hear about cooperative efforts across departmental and even college boundaries. As *Acumen* makes clear, social and scientific subjects—whether environmental change, cell formation and communication, or 18th-century America—benefit from investigation from a variety of perspectives. Faculty and students in the College of Arts and Sciences are well positioned to understand and take advantage of these multiple perspectives as they pursue their research cooperatively or individually.

Much as our research benefits the educational mission of our college, invigorating its faculty, challenging its graduates and undergraduates, making connections among various disciplines—its most important contribution is to the world beyond Lehigh's campus. Despite the proliferation of think tanks and research and development divisions in industry, an enormous amount of basic research remains located in the nation's universities. Here the people who will one day populate those corporate research divisions, or teach the next generation of students, receive their training, learn to communicate their discoveries, and develop an understanding of what it means to do ethical research. This publication makes visible the creativity and research achievements of the faculty who are their mentors and models.

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“We are based on
whatever we think
is ‘natural’ for
human beings.”

see page 26

