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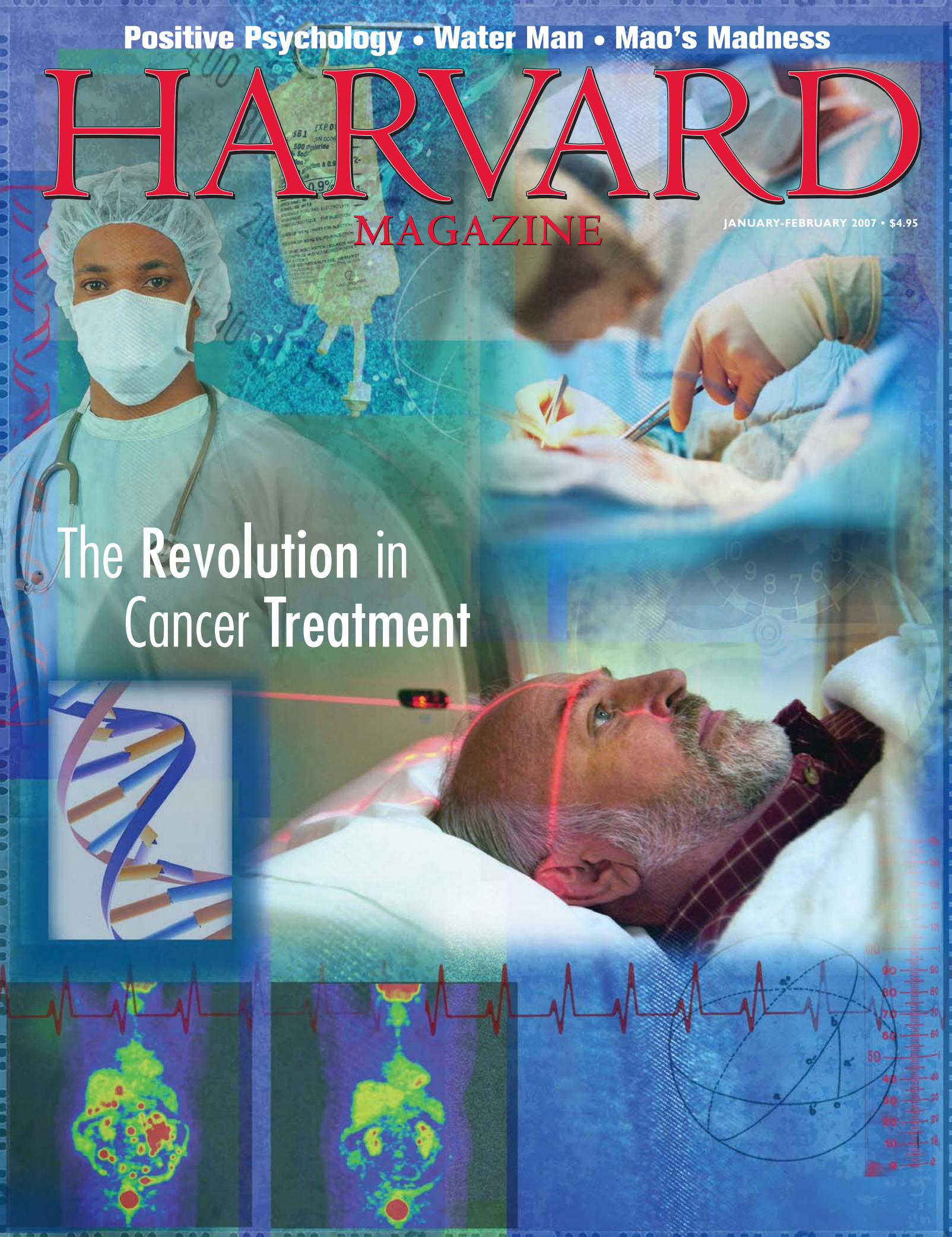

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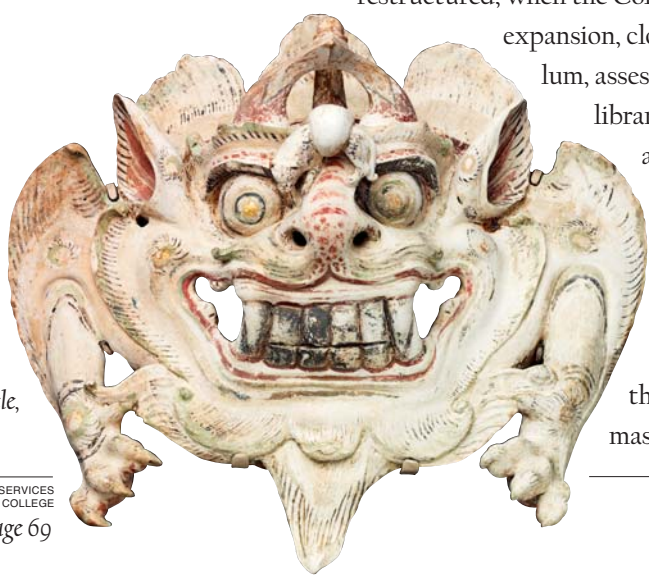

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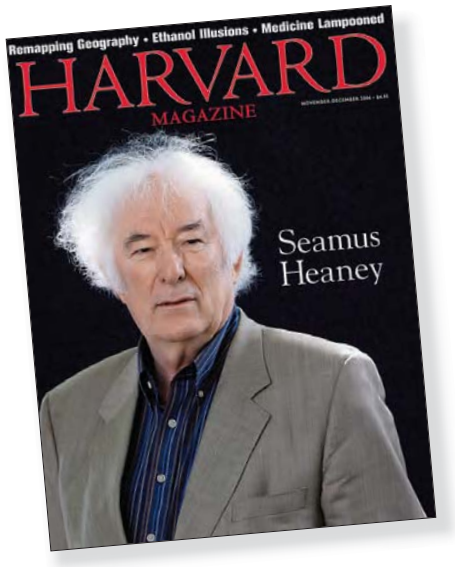
Geography rejuvenated, better times for poetry, personals



HYPE, HOT AIR, AND ETHANOL

Calling corn-based ethanol an "illusion" or "hype and hot air" ("The Ethanol Illusion," by Michael McElroy, November-December 2006, page 33), doesn't match McElroy's own facts. He is correct that corn ethanol alone is not a complete solution to our nation's dependence on foreign oil, but by his own admission, corn ethanol does reduce our oil imports, on net.

And it is also true that corn ethanol is hitting the limits of what can be produced sustainably: already, according to USDA projections, 20 percent of our 2006 corn crop will go to ethanol production, and as a result corn prices are rising rapidly. (Another less-noted problem is the greatly accelerated depletion of aquifers in the Midwest.)

Nevertheless, corn-based ethanol should not be viewed as an "illusion," but rather as a helpful "transition fuel." Corn ethanol is our first stop on the path toward a much better solution—"cellulosic

COMMUNICATING ABOUT CURES—AND CANCER

The harvard community is richly peopled with leading biomedical researchers. A few of them are doubly gifted: as writers, they explain disease, medicine, and the quest for new therapies in unusually clear, human terms. Many readers will have encountered Recanati professor of medicine Jerome E. Groopman and assistant professor of surgery Atul A. Gawande through the *New Yorker* and the *New England Journal of Medicine*, their books, or coverage in these pages. Fewer may recognize David G. Nathan, whose talent is on display in "Ken's Story," beginning on page 36. (Associate professor of medicine George D. Demetri, whose research and care for a patient are profiled in Nathan's account, exemplifies the caliber of the science done locally.)

The heartbreaking impetus behind biomedical research, of course, is that knowledge about disease and therapies remains limited. So another narrative—that of the terminal patient—still rests at the center of what it means to be mortal. Among these, few are as vivid, and as beautifully written, as "Hit by Lightning: A Cancer Memoir," by Marjorie Williams '79, assembled after her death in January 2005 by her husband, Timothy Noah '80, from fragments of her account-in-progress of her diagnosis, treatment, and life with the metastatic malignancy that killed her. It appears in *The Woman at the Washington Zoo,* a collection of her work edited by Noah.

Read together, Ken's story and Marjorie's speak fundamental truths about both life and the scientific quest to understand it better. —*The Editors*

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ethanol," or ethanol made from fibrous plant material such as wood chips, corn stalks, and other agricultural wastes, rather than from the more expensive sugars in corn kernels. Cellulosic ethanol has a much better energy balance than corn ethanol, containing four to six times the fossil energy used to produce it, as opposed to about 1.3 times for corn ethanol. In addition, cellulosic ethanol will be more economical to produce than corn ethanol, given the much lower cost of biomass relative to corn. Happily, cellulosic ethanol is closer to reality than the author seems to believe. The first full commercial projects should be running in about three years, financed by private investors.

Nor would additional agricultural land be required, as the author fears. According to a 2005 study by the Department of Energy, there is enough waste biomass in the United States to produce roughly 100 billion gallons per year of cellulosic ethanol, which is equivalent to half our nation's annual gasoline requirements.

Of course, I agree that conservation is also a necessary solution. This could include increased fuel-economy standards; more widespread use of hybrid, electric, and plug-in hybrid vehicles; and "smart growth" policies that reduce the average distance Americans drive each day and that encourage mass transit.

We shouldn't let the perfect be the enemy of the good by casting corn ethanol as an illusion. Instead, we should speed our transition from corn ethanol to cellulosic ethanol and pursue the other policy solutions that are under our control. We can eliminate our dependence on foreign oil. And we can do so while enhancing our national security, creating new industries and new jobs, and mitigating the risks of global warming.

Sanjay J. Wagle '92
Burlingame, Calif.

Editor's note: Wagle is a venture capitalist whose firm invests in renewable energy technologies.

In noting that some optimists regard cellulose-based ethanol as a possible major replacement for oil imports, McElroy does not go far enough when mentioning the major cropland requirement (280 million acres) that would be needed to replace half of U.S. gasoline consumption. Studies at both Oklahoma State University and the University of Nebraska-Lincoln estimate that one ton of switch grass might yield 80 to 100 gallons of ethanol (barely 1.5 barrels of gasoline equivalent).

Thus, to replace just 1 percent of current U.S. oil imports (12 million barrels per day), an operation would require a daily input of about 75,000 tons of switch grass. The switch grass growing season may be no more than six months. This means that at the start of winter, a "haystack" of 13,500,000 tons would be required for this 1 percent of equivalent oil imports. What is the energy cost of simply gathering this mass?

Robert C. Baker, M.B.A. '57
Darien, Conn.

McElroy goes a long way toward helping us understand that domestic ethanol production is no magic bullet for U.S. energy needs. He also suggests that if we could find ways of increasing ethanol production efficiencies by means of crop selection and integrated production processes, we could substantially increase benefits so as to raise the contribution of

HARVARD MAGAZINE INC.

Jeffrey S. Behrens '89 completed his term as a member of the Board of Directors of Harvard Magazine Inc. in October; we thank him for energetic, enthusiastic service, and welcome his election to the Board of Incorporators.

Leslie E. Greis '80, nominated by the executive director of the Harvard Alumni Association, has been elected a director, succeeding Behrens, by the Board of Incorporators. Henry Rosovsky, Jf '57, Ph.D. '59, LL.D. '98—Geyser University Professor emeritus and a past dean of the Faculty of Arts and Sciences and member of the Harvard Corporation—has also been elected an incorporator and director, and subsequently president of the Board of Directors, succeeding the late James O. Freedman '57, L '60. We look forward to working with them in the years ahead, as both governing boards continue to provide leadership and guidance important to the magazine's operations.

Catherine A. Chute, *publisher*
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ethanol to the energy and environmental mélange. So the first policy question then becomes whether we as a society are putting our resources where they should be in this campaign. Do ethanol subsidies catalyze research and development or do they simply promote an expansion of existing production inefficiencies? Even more fundamental, does the United States enjoy a comparative advantage in ethanol production? McElroy's analysis of the Brazilian experience and current technologies suggests otherwise, because an acre of sugar cane produces about 640 gallons of ethanol compared with about 386 for an acre of corn.

Supposing that the United States's greatest comparative advantage in energy production comes from coal, I ask whether the national energy policy should instead prioritize research and development dollars towards improving coal-based energy production (perforce including greenhouse-gas-reducing technologies)?

I hope that McElroy, or someone else, finds a way of giving an energy value to that other, often ignored, resource in these debates: natural ecosystems and biodiversity. Natural resource losses stemming from inorganic fertilizer runoff, irrigation diversion, and deforestation are essential elements of accurate energy/environment cost-benefit calculations.

ADAM CHERSON '84
New York City

AS A FARM OWNER in the Midwest, I follow these developments only tangentially, but I believe that McElroy owes some additional research to the corn-energy balance. He has neglected the fact that there are byproducts from the corn processing. When ethanol is produced from corn, only the starch is used, leaving the protein, fiber, vitamins, and minerals. Andrew Johnson, writing in *Barron's*, November 17, 2003, reported that one bushel of corn not only yielded 2.72 gallons of ethanol but also 17 pounds of distillers' grain. Distillers' dry grain contains about 25 percent protein (versus 7-10 percent for corn) and is an ideal feed for dairy animals in particular, but research continues on how best to utilize this feed for all animals. There are also byproducts from the animal production that can be recycled as fertilizer supplements or stripped of their methane potential and then burned in much the same way as the Brazilian bagasse to generate electricity.

KEITH N. JOHNSON, M.B.A. '62
North Smithfield, R.I.

I SO RARELY get a chance to pick on Harvard that I can't resist. The sentence beginning "First is the expense associated with transport: the hydroscopic properties of ethanol..." has an error. A hydroscope is a device for viewing under the

ON OUR WEBSITE

FOR COVERAGE of breaking news at Harvard, the editors invite you to visit the magazine's website, www.harvardmagazine.com. There you can also register for "Editor's Highlights," a summary of the contents of each new issue, e-mailed just as it is posted on the website.

AMPLIFICATIONS

JUDITH ROBBINS, M.T.S. '96, noticed what seemed a misquote in the excerpt from "Station Island" included in Adam Kirsch's "Seamus Heaney, Digging with the Pen" (November-December 2006, page 52). In her edition of the poem, published in 1985, the passage reads: "Take off from here. And don't be so earnest,/let others wear the sackcloth and the ashes." The passage as it appears in the magazine comes from *Opened Ground: Selected Poems 1966-1996*, published in 1997, and reads: "Take off from here. And don't be so earnest,/so ready for the sackcloth and the ashes." Kirsch assumes that Heaney revised the poem between the original publication and the later edition.

In "Hello, Geotech" (November-December 2006, page 44), Howard T. Fisher '26, who founded the Design School's Laboratory for Computer Graphics and Spatial Analysis in 1965, is described as a geographer and mathematical cartographer. His son, Morgan Fisher '64, points out that his father studied fine arts in the College and entered the design school to study architecture, but dropped out to design a house for his older brother. He went on to practice architecture and city planning with his own firm before returning to the design school as a full professor.

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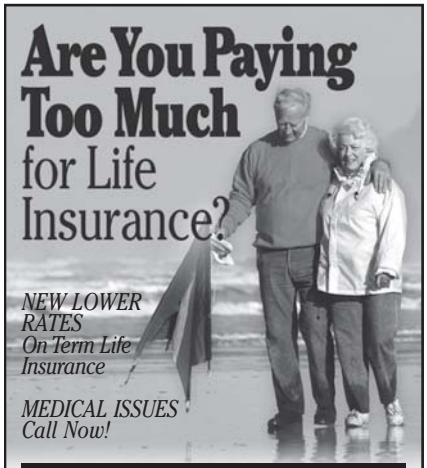

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surface of water. A substance that absorbs atmospheric water is hygroscopic.

Bruce P. Shields '61
Wolcott, Vt.

How to reduce gasoline (and diesel) consumption? Not with a dollar-a-gallon tax, which would reduce consumption selectively, primarily among the less affluent. Instead, impose a graduated annual fee based on rated fuel economy on all cars, trucks, and SUVs. Begin at zero for 40 mpg vehicles, and increase the fee with decreasing rated mpg. The fee would be payable with auto license renewal, and should be high enough to bring in $140 billion annually, like a dollar-a-gallon tax on gasoline. Annual fees for 20 mpg vehicles would have to be a few thousand dollars. We could choose any vehicle, but high horsepower and/or large size would cost more than they do already. Isn't this the American way?

Elliott Doane '51
Oklahoma City, Okla.

BORN-AGAIN GEOGRAPHY

Thanks for the fine piece on the discipline of geography at Harvard ("Hello Geotech," by Christopher Reed, November-December 2006, page 44). I arrived at the College shortly after the decision to terminate the department. Readers might be interested to know that the University explored the possibility of restoring a concentration (and perhaps a department) of geography in the late 1950s. In one of the years between 1958 and 1960, the University invited the leading historical geographer in the English-speaking world, H.C. Darby, of University College, London, to be a visiting professor and offer a survey course in historical geography. I was a graduate student in history and was asked to serve as Darby's teaching fellow. I can remember him telling me, in a walk along the Charles River on a beautiful spring day, that Harvard had offered him a full professorship and the opportunity to reinstitute a geography program. But, he said, the administration had refused to provide the funds to set up a cartographical laboratory, without which he did not think a real concentration possible. He also said that he hoped for an Oxbridge professorship and a "K" if he returned to England. And so he did, becoming professor of geography at Cambridge University and Sir Clifford Darby. He was

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an elegant man and a distinguished scholar. Remaining in the U.K. was clearly the right thing for him, but, alas, it meant that geography at Harvard was not then to be revived. Peter Bol's initiative is welcome indeed.

Stanley N. Katz '55 , Ph.D. '61
Princeton, N.J.

Three cheers for Harvard's new Center for Geographic Analysis! For those who wish to learn more about geography in higher education in recent years, a good place to start will be "Geography's Place in Higher Education in the United States," by Alexander Murphy, in the 2007 volume of the *Journal of Geography in Higher Education.* The Association of American Geographers' *Guide to Geography Programs in the Americas* is also worth browsing.

George E. Clark
Environmental resources librarian
Harvard College Library

Younger Americans can be characterized as a "lost generation" in the sense of not knowing where Chicago, Texas, Afghanistan, or Luxembourg are located. But our geographical ignorance is a lot more serious than that. What matters most is the ignorance of Americans about how people live in places other than the United States.

Today, perhaps the most important ways in which the United States differs from the rest of the world have to do with crime, poverty, welfare, and education. Most reasonably educated Americans are aware that Europeans generally regard the United States as barbaric because, unlike most European countries, we have the death penalty and no gun control. Some really sophisticated Americans know that the only countries in the world with higher rates of execution, imprisonment, and violent crime than ours are all in the Third World. But the only Americans who have any *(please turn to page 93)*

SPEAK UP, PLEASE

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Right Now

The expanding Harvard universe

HEALTH AND HABITS

Eight Americas

A map of Americans' health status and longevity resembles a microcosm of global health extremes. Although Asian-American women in Bergen County, New Jersey, live to an average age of 91—three years longer than women in Japan (the country with the highest national female life expectancy)—Native American men in South Dakota live only 58 years on average, a lifespan akin to that of men in Azerbaijan. Young and middle-aged blacks in high-risk urban areas have mortality risks closer to those in the Russian Federation or parts of sub-Saharan Africa than to those in neighboring white suburbs. Despite efforts to reduce racial and ethnic health inequalities in recent years, the longevity gaps within the U.S. population have remained virtually unchanged for more than two decades.

A recent study headed by Saltonstall professor of population policy Christopher Murray, director of the Harvard Initiative for Global Health, has sought to uncover the major determinants of lifespan disparities among groups of Americans in the hope of identifying more effective interventions. The researchers tracked longevity patterns by place of residence, controlling for race, income, education level, population density, and homicide rates in order to isolate the combinations of factors that contribute to communities' differential health outcomes. They found dramatic variations in mortality rates across counties that could not be reduced to a single cause such as race or socioeconomic status.

The study authors consolidated their results into "Eight Americas"—eight national subgroups, ranging from best to worst, that capture the geographic and socio-demographic differences in life expectancy observed in the population. America 1, at the top, consists of 10 million Asians, with an average per capita income of $21,566 and an 80 percent high-school completion rate, "living in counties where Pacific Islanders make up less than 40 percent of the total Asian

Researchers found large mortality disparities by region. Below, life expectancy at birth for white males and females, based on death data from 1997-2001.

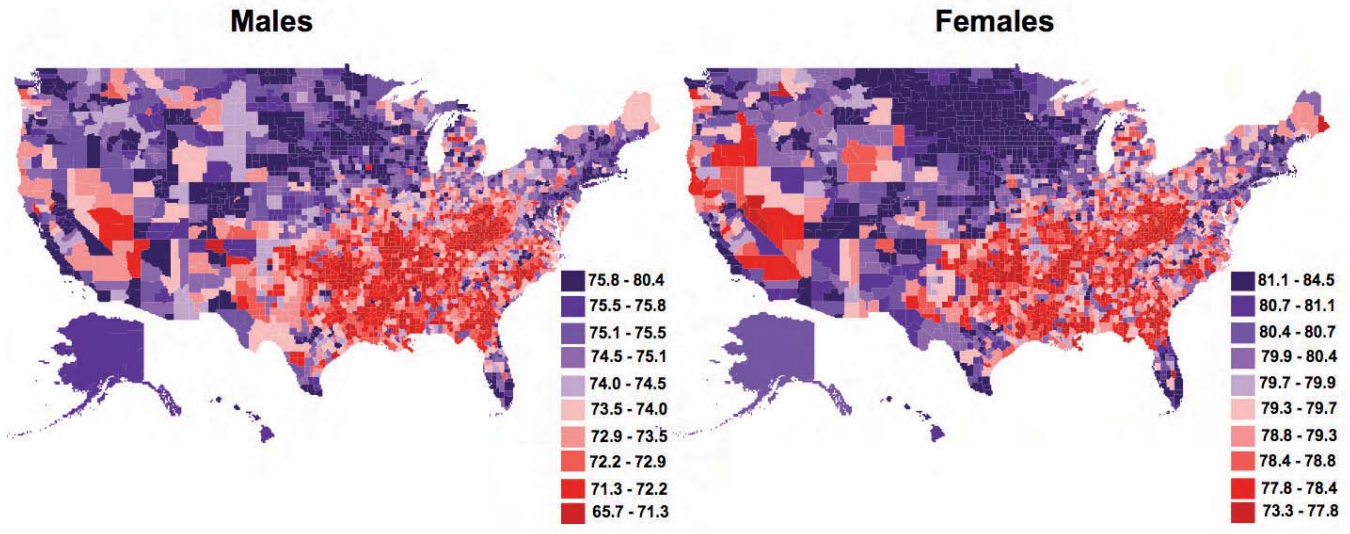

Image courtesy of Christopher Murray

population." America 8 includes 7.5 million high-risk urban blacks, living in counties with an average per capita income of $14,800, a high-school completion rate of 72 percent, and a probability of homicide death between the ages of 15 and 74 greater than 1.0 percent.

The mid-ranking groups reveal some unexpected disparities. Low-income rural whites living in the northern plains and Dakotas (America 2), for instance, live slightly longer than "Middle America" whites (America 3), who make up the large majority of the population and have the highest average per capita income. Native Americans fare worse when they live in or around reservations in the West (America 5), but rank on a par with mainstream whites when they live elsewhere. Meanwhile, low-income rural whites in Appalachia and the Mississippi valley (America 4) have a life expectancy comparable to that of Mexico and Panama.

The data confirm the importance of place in determining longevity. "It's not so much the physical environment or the climate that makes a difference, but the social and cultural things that change with place," Murray says. "Culture largely defines what you eat and whether you exercise, and this has to do with how you were brought up and what your peers do. Once you adopt habits, you tend to keep them."

Mortality disparities across the eight Americas are most concentrated among young and middle-aged adults and result from a number of chronic diseases and ailments attributable to well-known risk factors, such as using alcohol and tobacco, being overweight or obese, or having elevated blood pressure or problems with cholesterol and glucose. Even in the worst-off urban areas, drugs and violence account for only a small portion of the excess early mortalities. "If you take away deaths from homicide and HIV," Murray points out, "Baltimore still has one of the worst life expectancies." The major killers are heart disease, lung disease, diabetes, cirrhosis of the liver, and cancers.

The study's findings challenge the assumption that universal health insurance alone would significantly reduce the nation's glaring health inequalities. Variations in health-plan coverage across the eight Americas are in fact small relative to the steep gradient in health outcomes. Education campaigns aimed at altering behaviors are also insufficient, Murray argues. "The exhortation for people to change their lifestyle simply doesn't work, except among the highly educated and well-to-do," he says.

The authors call instead for proactive interventions that target the major physiological risks in communities with high mortality. "If I had my influence on policy," Murray says, "I would put a huge effort into tackling blood pressure, cholesterol, and blood sugar, for which we have effective pharmacological strategies." America's longevity gap is unlikely to diminish, he concludes, until "there's a broader engagement of people living in communities with really poor health, and that gets translated into the political arena." —ASHLEY PETTUS

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FRUITFUL ARCHAEOLOGY

Figs Were First

New archaeobotanical evidence pushes the dawn of agriculture back to 11,400 years ago, when humans living in a village eight miles north of ancient Jericho began propagating seedless figs. Ofer Bar-Yosef, professor of anthropology and curator of Paleolithic archaeology at Harvard's Peabody Museum, published the findings recently in the journal *Science*, along with coauthors Mordechai E. Kislev and Anat Hartmann of Bar-Ilan University in Israel.

PHILIP HARVEY/CORBIS

The figs, nine still whole among more than 300 smaller pieces, were found in the ruins of a burned house at Gilgal 1. The fire permitted reliable dating of the site, and had the further desirable effect—from an archaeologist's perspective—of carbonizing and preserving the fruits. The figs proved to be a variety that grows only on sterile female trees, which occur occasionally in the wild as a result of genetic mutation. They bear soft, sweet, edible fruit, but cannot reproduce except from shoots, making them an evolutionary dead end. With human intervention, however, stems cut from fig trees and planted in soil will root fairly easily.

Another cache of figs, found 1.5 kilometers away at the Netiv Hagdud site, proved to be the same mutant variety. "Humans must have recognized that the fruits do not produce new trees, and fig-tree cultivation became a common practice," says Bar-Yosef. Previously, the domestication of grains and legumes a thousand years later had been considered the earliest evidence of the momentous shift in human history from hunting and gathering to a more sedentary lifestyle.

Because they produce three crops a year, figs made an ideal staple food. They have been found at numerous Neolithic sites in the Jordan Valley, along with acorns and wild varieties of wheat, barley, and oats, says Bar-Yosef, indicating that "the subsistence strategy of these early farmers was a mixed exploitation of wild plants and initial fig domestication." He and his colleagues suggest that ease of planting, along with an improved taste resulting from minor mutations, may explain why figs were domesticated 5,000 years before grapes, olives, or dates. —JONATHAN SHAW

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BEYOND THE OPTIC BARRIER

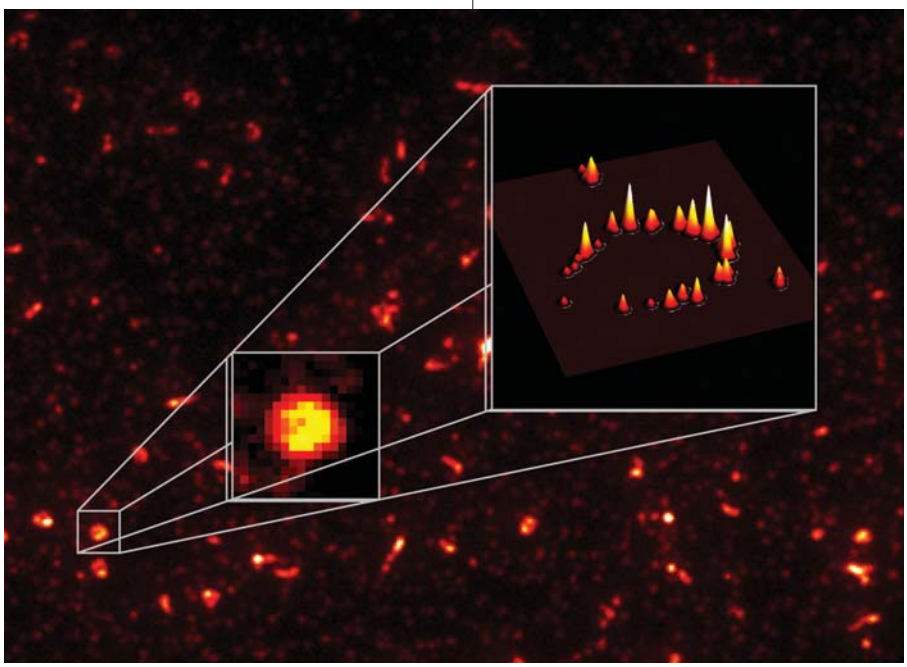
Unleashing Light

The light microscope launched modern biology in the seventeenth century, letting scientists view the components of life that exist far beyond the range of unaided human vision. But light travels in waves, and its wavelength prevents researchers from focusing on details below a certain size limit without creating interference. As a result, light microscopes cannot show details that are less than about 200 to 300 nanometers apart. This is fine for viewing a single cell, but look inside it and things blur. Even a *cluster* of proteins, each a mere three to 10 nanometers in size, appears as an indistinct blob. (A nanometer is a billionth of a meter; a human hair is 80,000 nanometers in width.)

Creative new techniques developed in the past few years, however, have extended the boundaries of what these microscopes can reveal. The latest approach, from the lab of Xiaowei Zhuang, professor of chemistry and chemical biology at Harvard and a Howard Hughes Medical Institute investigator, uses fluorescent molecules that can be switched on and off to create images with more than 10 times the resolution of traditional light microscopes.

Zhuang says that light, despite its limitations, has important advantages for viewing cells. Electron microscopy, though more powerful in resolution, requires that cells be killed and chemically fixed. With electron microscopy, she says, "You're looking at a still image," rather than capturing activity in a cell. Light, on the other hand, is noninvasive, so it can be used to image live cells; scientists can use a variety of stains and fluorescent tags that let them view specific proteins or structures of a cell in different colors. Ideally, Zhuang says, "one would want to have a method that combines the merits of both": the high resolution of electron microscopes paired with the flexibility of optical microscopes.

The new technique, which Zhuang developed with graduate students Michael Rust and Mark Bates, makes use of fluorophores—molecules that absorb light and then fluoresce, emitting light at a different wavelength. Fluorophores have been used in microscopy for many years because they can be attached to specific



Using conventional imaging techniques, a circular piece of DNA (bottom left) appears as an indistinct blob when magnified (center). A new technique permits three-dimensional resolution 10 times better, revealing the crisp ring structure of the object (upper right).

Image courtesy of Xiaowei Zhuang

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molecules in cells, allowing scientists to track their location.

Normally, when a sample of fluorophores is exposed to light, they fluoresce in unison. Under an optical microscope, this sea of individual spots cannot be resolved if they are densely packed. Even so,

"We'd like to look at events in live cells with nanometer resolution, in real time. That's the hope."

Zhuang says, scientists have known how to determine mathematically the position of a single, isolated fluorophore by calculating the center of the fuzzy spot of light detected by the microscope. The trick was to find a way to turn the lights out on a group of fluorophores, allowing only a few at a time to light up so that the microscope could pick out individual spots.

Several years ago, Zhuang's group discovered a fluorophore that has an on-off switch—when exposed to red light, it is inactive, but when exposed to green, it has the ability to fluoresce. "This was the additional step that allowed us to control how many molecules are active," she says. Using this molecule, they can first turn off all the fluorophores with a red light, and then expose the sample to a small amount of green light—so small that only a few of the fluorophores will activate at a time. An image of those scattered fluorophores can then be made and their positions determined to within nanometer accuracy. By repeating this process many times to locate the position of all fluorophores, the scientists can create a whole image.

Zhuang's team calls the method stochastic optical reconstruction microscopy, or STORM, and published a demonstration in a recent edition of *Nature Methods*. With this technique, "You're going to get many of the advantages of optical imaging, but sharper and crisper by more than an order of magnitude [10 times]," she says. As an example, her team attached 20 to 40 fluorophores to a circular string of DNA and proteins and was able to resolve its ring-like structure, where conventional microscopy would have shown only a blob. Zhuang's team is now hunting for other fluorophores that have the same ability to switch on and off, but in different colors.

The main drawback of the technique is the time it takes to gather multiple views and stitch them together. Creating an image can take a few minutes, making it best for viewing fixed structures. But Zhuang's team hopes to improve it further, to be able to capture the movements of molecules in cells, which happen on the order of seconds to milliseconds. She says STORM is one of a few promising approaches that have the potential to turn high-resolution still images of the cell into live action. "We'd like to look at events in live cells with nanometer resolution, in real time," she says. "That's the hope." —COURTNEY HUMPHRIES

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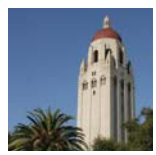

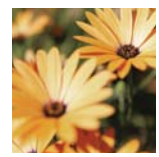


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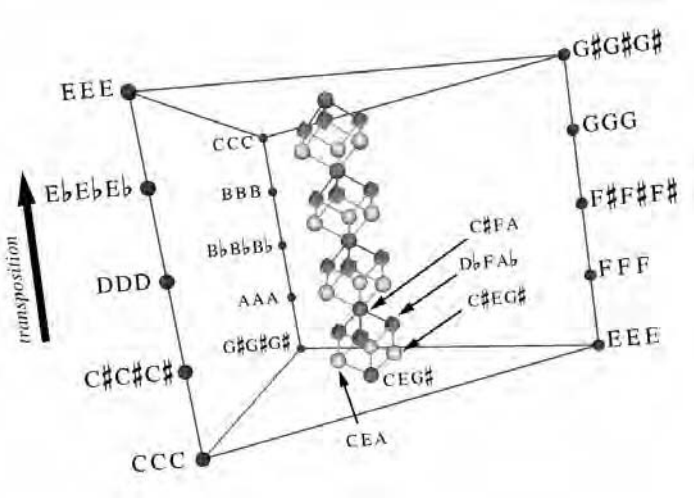
ORBIFOLD EUPHONIA

Mapping Music

Humans seem to have an instinct for music. Certain songs have a quality that makes us want to tap our toes and sing along. We can't quite say what makes good music, but we know it when we hear it. Sheet music, which tells musicians very precisely which notes to play and when, provides little clue to that mystical ingredient, but Dmitri Tymoczko '91 has devised a new way to map music that aims to do just that.

Tymoczko (pronounced *tim-oss-ko*), who spent this past academic year as a composer in residence at the Radcliffe Institute for Advanced Study, has developed a way to represent music spatially. Using non-Euclidean geometry and a complex figure, borrowed from string theory, called an orbifold (which can have from two to an infinite number of dimensions, depending on the number of notes being played at once), Tymoczko's system shows how chords that are generally pleasing to the ear appear in locations close to one another, clustered close to the orbifold's center. Sounds that the ear identifies as dissonant appear as outliers, closer to the edges.

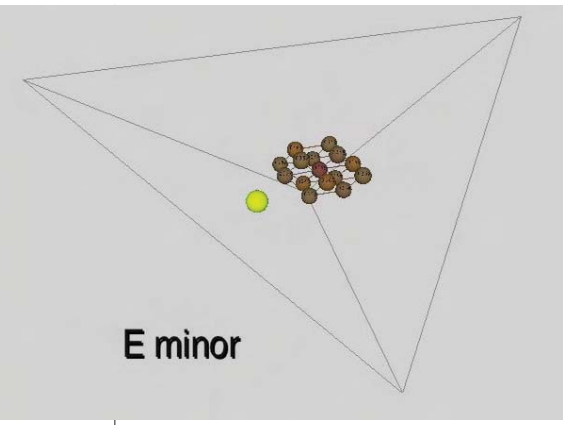


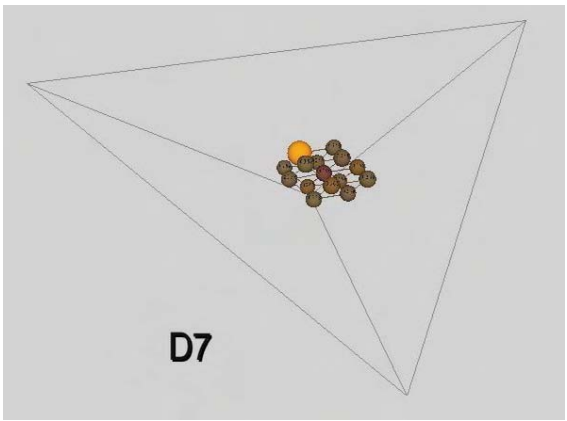
An orbifold that depicts three-note chords, with major and minor triads found near the center

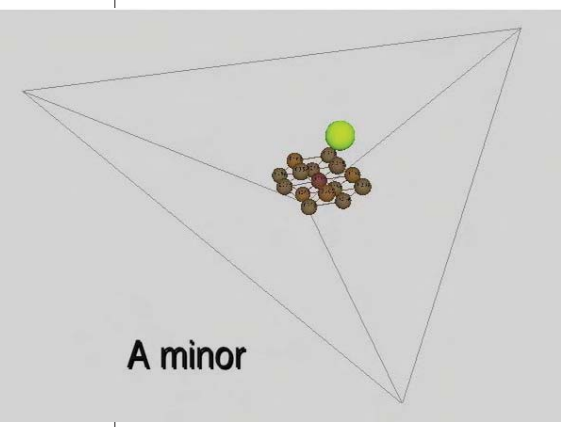
IMAGE COURTESY OF DMITRI TYMOCZKO

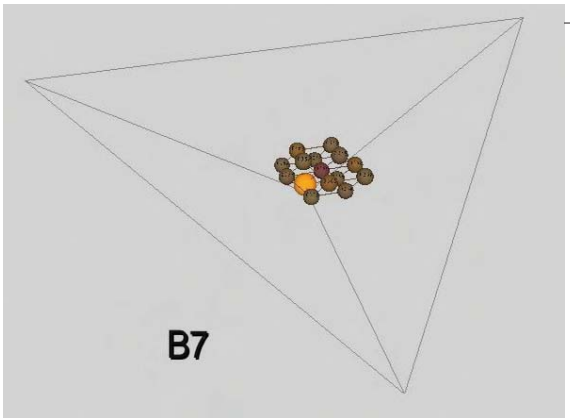
The system "allows you to translate these half-formed intuitive understandings into very precise, clear language," says Tymoczko, an assistant professor of music at Princeton. "Personally, I find that incredibly cool." So, apparently, did *Science*, which recently published his mathematically based exposition—the only music-theory paper the journal has accepted in its 127-year history.

Tymoczko's quest didn't begin with









Chopin's hermetic E minor prelude, long baffling to music theorists, traces out a logical pattern of chords (as represented by the moving colored circles) in a four-dimensional orbifold. Each image (from an animation with piano accompaniment that may be viewed at http://music.princeton.edu/~dmitri/chopin3.mov) depicts one chord of the prelude. Changes in the large ball's color indicate how evenly the chord divides the octave. Orange represents perfect evenness, blue perfect uneveness. The clustered gray balls represent possible chords that might be played next.

He made his first experimental maps using scissors and paper, then graduated to marshmallows connected with toothpicks.

technical complexity. He made his first experimental musical maps using scissors and paper, then graduated to marshmallows connected with toothpicks. When he gives talks today, he hands out school supplies and has each listener assemble a Möbius strip, a rectangular strip of paper given a half twist and then taped together at the ends to form a bracelet-like loop. One trip around the loop lands the tip of a pen back where it began, but on the opposite side of the paper, just as a trip up an octave of musical notes lands a musician at the same note, but one octave higher: in the same place, but not.

For a map that would represent music accurately, Tymoczko needed a shape folded once to acknowledge the circular nature of octaves, and again to reflect the existence of two different combinations that produce the same result—for example, A plus C sounds the same as C plus A. "On a piano, there are many, many different ways of playing the same chord," Tymoczko says. "I've collapsed all the different ways of playing a chord into a single point on the map."

Tymoczko spends time with scientists and it was a physicist who suggested the orbifold upon hearing his description of the musical map's properties. Tymoczko notes that physicists are forever using music as a metaphor for their work; now, he says, music can reciprocate.

Life inside an orbifold is a non-Euclidean world, meaning it doesn't adhere to the traditional properties of geometry. One might walk in a straight line and end up back where one started, except everything is backwards. ("Like walking through the looking glass," Tymoczko says.) With help from professor of mathematics Noam Elkies, another composer, Tymoczko worked out the mathematics behind the geometry that now allows users of a computer program (available for download on his Princeton website; see below) to map their own musical compositions.

Tymoczko has used his system to plot a variety of works in the Western musical tradition, ranging from eleventh-century Gregorian chant to more recent classical and jazz pieces. The system may not work as well with compositions that don't consist of chord progressions, but Tymoczko says it is broadly applicable otherwise. "The idea that harmonies should sound good, that chords should be consonant rather than dissonant, is a widely shared musical value, and you find it in many different cultures," he says.

He envisions using the mapping system to help schoolchildren understand music. Other applications might include computer programs for composing and analyzing music, and maybe even the invention of new instruments whose design makes it easy to play pleasing compositions. He is less sanguine about applications for the recording industry. "It's probably not going to tell you why one Britney Spears song sells and another one doesn't," he says, because most pop music songs already consist of familiar, pleasing chords rearranged in various pleasing orders. In other words, pop music producers have already figured out, intuitively, what Tymoczko's mapping system shows.

—ELIZABETH GUDRAIS

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Images courtesy of Dmitri Tymoczko

Montage

Art, books, diverse creations

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Ideas, Appassionato

Daniel Barenboim's Norton Lectures ranged from the pianoforte to Palestine

by RICHARD DYER

DANIEL BARENBOIM'S prodigious musical career has generated both acclaim and controversy. In September, the pianist and conductor joined the prestigious list of musicians—including Igor Stravinsky, Aaron Copland, Leonard Bernstein, John Cage, and Luciano Berio—who have been Charles Eliot Norton professors of poetry at Harvard. In his six Norton lectures on "Sound and Thought," Barenboim won applause and did not shy away from defending some of his controversial decisions and activities—conducting the first performances of Wagner's music in Israel in more than 60 years, for example, and creating with his friend Edward Said, the late critic, the West-Eastern Divan Orchestra, made up of young Israeli and Arab musicians who rehearse and perform together (though not in all their countries of origin, including Israel).

Daniel Barenboim conducting the West-Eastern Divan Orchestra, whose members are young Israeli and Arab musicians.

A few weeks shy of his sixty-fourth birthday at the time of the lectures, Barenboim remains indefatigable. In addition to delivering the Nortons, he conducted a rehearsal of Tchaikovsky's Sixth Symphony with the Harvard-Radcliffe Orchestra ("The best the orchestra has ever sounded," a player told the *Crimson*, summing up the consensus), presided over a master class, and held formal and informal meetings with students—as well as playing three performances and an open rehearsal of the Schoenberg Piano Concerto and Beethoven's Fourth Piano Concerto with the Boston Symphony Orchestra.

Despite this whirlwind, he seemed chagrined that he was unable to fulfill one part of his ambitious design for the Norton lectures. He began each session by playing four preludes and fugues from Bach's *Well-Tempered Clavier,* covering all of book I. He had wanted to add the corresponding 24 preludes and fugues from book II at the end of each lecture, but this wasn't possible, he explained, because of the dining schedule in Memorial Hall. "I

Photograph by Alonso Gonzalez/Reuters/Corbis

OPEN BOOK

Palace Indignities

Alexis Gregory '57 is a collector of Renaissance and Baroque bronzes, a member of the Harvard University Art Museums Collections Committee, and the founder of the Vendome Press in New York City, which he now co-owns with Mark Magowan '76. They publish about 15 illustrated art books a year, recently including one written by Gregory, *Private Splendor: Great Families at Home* ($50). He and photographer Marc Walter roam inside eight great European houses that have been owned by the same families since they were first built. They were permitted so close a look round not merely because the owners are friends of Gregory's, but because, one supposes, exposure is among the economic indignities facing palace dwellers today. As Gregory puts it:

Owning or, even worse, having to keep up a great ancestral home has always been a difficult proposition. Enemies once attacked with armies and cannon fire, revolutionaries stormed the gates, governments confiscated land or attempted to collect taxes and inheritance duties. Families fought for control while nature waged an unending battle and acres of roof constantly needed repairing. Many gardeners, cooks, maids, and footmen are needed to maintain the style of life for which stately homes were built, and one wonders why the descendents of the original owners do not simply give up and stop sacrificing their fortunes and peace of mind to continue a lifestyle that has been of the past for nearly a century.

The answer is undoubtedly ancestor worship. Palace building is the most fundamental expression of power. It can be seen clearly in the vast houses being built today in Palm Beach, Dubai, or in the suburbs of Moscow. It was once evident on New York's Fifth Avenue, which, in the 1890s, resembled a condensed tour through the châteaux of the Loire. But the houses of the newly rich have never been able to boast of a gloriously long dynastic history, and that is what the owners of the splendid palaces seen [here] do not want to give up. They will marry dollar or peso heiresses, dispose of the family jewels, auction off their furniture, sell entrance tickets, open zoos and cafeterias, put on pop concerts, petition ministers, beg the local government for support, rent out their rooms of state for company meetings, let in the local butcher for his daughter's wedding.... And the visitors imagine that somewhere, in an area of the house they will never be invited to, life goes on as it once did. In some houses, it does indeed, although the footmen are now hired by the day rather than for life, and often the hosts are entertaining tycoons who have rented the stately pile for a shooting weekend.

Schloss St. Emmeram, in the ancient city of Regensburg, Bavaria, is the largest private home in Europe still kept up by a princely family.

MARC WALTER/FROM THE BOOK

I suppose if I did it," he remarked, "we'd all be here until breakfast."

Barenboim's playing was generally magnificent, within the terms of his chosen style, which represents a form of transcription for the full resources of the nineteenth-century concert piano capable of imitating a full orchestra. The performances were notable for their internal balance, for their clarity, and for the color, emotion, and strength of characterization he brought to each voice in the counterpoint.

The playing served as a musical analogue to points the pianist made in his lectures, whose real subject was less "Sound and Thought" than "Music and Life." Music, for Barenboim, not only expresses what life is, but is also "an expression of what life could be or what it could become"—not just a metaphor for life, but a model for it. Paradoxically, he said very little about actual pieces of music. Instead of resting on technical analysis, his argument pursued the phenomenology of sound and the perception of sound, the internal processes of the music, and what musicians must master in order to move music from page to performance.

For Barenboim, music presents an infinite range of simultaneous possibilities—"which we as finite human beings can use." Much of it, like the Bach, also consists of independent voices, each with its own indispensable function in fulfilling a design and communicating a complex, multi-layered message, full of internal contradiction as well as internal harmony. A performer, particularly an instrumentalist in an orchestra, must assert his individuality while listening to others and realizing his or her place in the larger picture—and at the same time achieve a poise between discipline and passion.

Simultaneously, a musician must integrate the constantly shifting claims of rhythm, melody, harmony, volume, and tempo. "Conflict, difference of opinion, is the very essence of music...our capacity [as musicians] is to bring all the different elements together in a sense of a proportion so that they lead to a sense of the whole." At another point, Barenboim compared orchestral performance to a "practical Utopia, from which we might learn about expressing ourselves freely and hearing one another."

From this it was only a short step for Barenboim to discuss some of his contro-

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Off the Shelf

Recent books with Harvard connections

Modern Liberty and the Limits of Government, by Charles Fried, Beneficial professor of law (Norton, $24.95). Fried assesses individual liberty in the welfare state, its two most potent rival ideals —equality and community—and the government regulations that support and menace it. This accessible book is part of the Issues of Our Time series edited by Fletcher University Professor Henry Louis Gates Jr. In book-jacket endorsements, Cogan University Professor Stephen Greenblatt, who disagrees broadly with Fried, calls the book "vexingly invigorating," and former *New York Times* columnist Anthony Lewis '48, Nf '57, writes, "He means to be provocative and is, making us think about profound issues."

Take Me to the River: A Wayward and Perilous Journey to the World Series of Poker, by Peter Alson '77 (Atria Books, $24). Seasoned player Alson goes to Vegas for the Big Game in hopes of winning enough to pay for his wedding, and is pretty funny about it along the way.

Men: Evolutionary and Life History, by Richard G. Bribiescas, Ph.D. '97 (Harvard University Press, $28.95). The author, an assistant professor of anthropology at Yale, came across an Ache man in Paraguay wearing a baseball cap that said, in English, "There are three stages to a man's life: Stud, Dud, Thud." That sums it up well, writes Bribiescas, offering insights into *why* boys will be boys.

American Islam: The Struggle for the Soul of a Religion, by Paul M. Barrett '83, J.D. '87 (Farrar, Straus & Giroux, $25). Islam is now a U.S. faith, with six million adherents in a subculture torn between moderation and extremism, as emerges in this lively group portrait. Barrett, now at *Business Week,* was formerly a reporter and editor at the *Wall Street Journal.*

I Feel Earthquakes More Often Than They Happen: Coming to California in the Age of Schwarzenegger, by Amy Wilentz '76 (Simon & Schuster, $26). Wilentz moved to Los Angeles from Manhattan in 2003 and became "an expert on tremors real and imagined," as she tells in this account of her explorations of California and where it stands.

THE NATIONAL PORTRAIT GALLERY, SMITHSONIAN INSTITUTION; GIFT OF VARINA WEBB STEWART

First Lady of the Confederacy: Varina Davis's Civil War, by Joan E. Cashin, Ph.D. '85 (Harvard University Press, $29.95). Varina Howell Davis, portrayed at left before her marriage, was the devoted wife of Jefferson D., president of the Confederacy, who was stiff, much older, and demanding. A complex, conflicted woman, pro-slavery but pro-Union, she moved to New York City after Jefferson's death, became a friend of Julia Grant, widow of Ulysses S., and declared in print that the right side had won the war. Cashin is associate professor of history at Ohio State, writes well, and concludes in this first biography of Varina Davis that "her tenure as First Lady was for the most part a disaster."

God Has a Dream: A Vision of Hope for Our Time, written and read by Desmond Tutu, LL.D. '79 (Maui Media, a four-CD audiobook, $24.95). Love, laughter, and peace are his goals, as the archbishop offers an antidote to private suffering, the conflict in the Middle East, war in Iraq, and terrorism.

versial attitudes, decisions, and activities in the Middle East—views that arise from his understanding of how music functions. He prefers to describe the West-Eastern Divan project not as political, but humanistic in intent. The purpose of the orchestra is to "fight ignorance on both sides; for each side to recognize the legitimacy of the narrative of the other... You cannot make music through politics, but perhaps you can give political thinking an example through music."

The audience, too, has obligations: to listen with informed attention, to exercise what Barenboim called "the moral responsibility of the ear." He drew a distinction between hearing and listening: we can't help listening because we don't have earlids, but "hearing is listening with thought." "The audience needs to concentrate as much, as exclusively and fully, on the music as the performer does."

Overall, the lectures were intelligent, allusive, cosmopolitan (Barenboim was born in Argentina, grew up in Israel, and has lived most of his adult life in Europe and America), and mercifully short. But in addressing past controversies they stirred up a little controversy of their own. By contract, the Norton Lectures are supposed to represent new and previously unpublished material. But Barenboim simply spread out over six lectures the material he had already delivered earlier in the year in five presentations for the BBC's equally prestigious Reith Lectures. Those are available on the Internet, so the Norton audience in Sanders Theatre and Paine Hall could print them out and follow them like a music-lover reading a score at a concert.

The intellectual range and articulate vigor of Barenboim's previous writings made him a strong choice for the Norton post, and the things he has to say are important enough to say more than once. No one wanted or expected the leopard to change his spots, but he probably should have changed more of his words, and he will have to come up with something different when the lectures are published by Harvard University Press.

Barenboim followed his BBC lectures with question-and-answer sessions and repeated the strategy at Harvard, with less effective results. The BBC had selected many prominent and prepared respondents; the questions in Cambridge were often predictable (the new music

IMAGERY

Where the Eyeballs Are

"These are trying times for political cartoonists," observes Kevin P. Kallaugher '77. "I'm trying something new." He's taking his satire digital.

Kallaugher, known to friends and victims alike by his signature "KAL," lost his job as political cartoonist of the *Baltimore Sun* a year ago, after 17 years of skewering politicians and others for that audience. The *Sun* is one of 11 papers owned by the Chicago-based Tribune Co., which cut 6.5 percent of its work force to save money. KAL's last cartoon for the *Sun* showed a host of local and national pols, dressed as cheerleaders, rejoicing as the artist departed, carrying his sketchpad and pens.

He remains a weekly contributor to the London-based newsmagazine the *Economist,* his longest-running gig. The issue of November 11-17 had KAL's work on the cover—a drawing of the head of a beady-eyed George W. Bush emerging from the top of star-spangled cowboy boots, under the words "The incredible shrinking presidency."

Kallaugher went to England for a bicycle tour after college, took a job as a point guard on a semipro basketball team, coached that sport at Sussex University, worked as a pound-an-hour maintenance man, and performed as a street-artist puppeteer until two weeks before his work permit expired, when the *Economist* hired him in 1978 as the first staff cartoonist in its then 135-year history.

His work has appeared in scores of other newspapers and magazines worldwide. He is now a master among professional editorial cartoonists, a band that numbers, he estimates, only about a hundred in the United States, their ranks crumbling as newspapers lose readers. Tough times. "I've realized," he says, "that I have to get to where the eyeballs are"—to television and the Internet. At the Walters Art Museum in Baltimore last summer, he demonstrated how he proposes to do that.

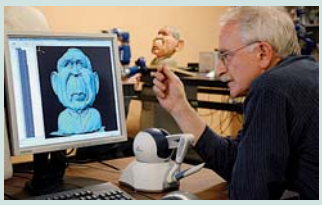
KAL has made about 5,000 editorial cartoons for print media. The Walters mounted a retrospective of more than 200 of them in *Mightier than the Sword: The Satirical Pen of KAL,* perhaps the largest exhibition in the United States ever devoted to a single cartoonist. (Coincidentally, he published his fifth collection of drawings, *KAL Draws Criticism,* available from www.kaltoons.com, which shows him in complete control of the old-fashioned scratchy line.) In a museum auditorium, Kallaugher unveiled his hope for new eyeballs, his "Digital Dubya."

George W. Bush, M.B.A. '75, drawn for this magazine by Kevin P. Kallaugher '77

DD is a three-dimensional bust of Bush, sculpted by KAL from styrofoam and clay and based on his editorial drawings. He is an artist-in-residence at the University of Maryland, Baltimore County, where the staff of its Imaging Research Center first scanned the bust so that an image of it could live in a computer and then animated the scan so that the bust had moving parts. KAL (or another puppeteer) can manipulate two joysticks and foot pedals to turn Dubya's head, make his lips curl as he speaks from the side of his mouth, make his ears honk, and wiggle his left or right eyebrow. Kallaugher does a remarkably good impersonation as he puts words into the president's mouth. George W. Bush has been brought to life. He can speak in real time and answer questions: an interactive political cartoon.

"I have been introducing my new partner to interested players on television, cable, and the Internet," says KAL. "It is my hope that we will be on TV and computer screens in the near future."

—CHRISTOPHER REED



KAL covers his styrofoam bust of George W. Bush with clay. A technician at the Imaging Research Center of the University of Maryland, Baltimore County, scans the bust to bring it into the digital world. KAL learns how to make the puppet in the computer move by manipulating joysticks and foot pedals. A rich variety of expressions is possible as the president answers questions.

Images courtesy of Kevin P. Kallaugher

question, the crisis-in-classical-music question, the Toscanini-versus-Furtwängler question, and, repeatedly, the Palestinian question).

But the answers did display the maestro in a more informal mode, with touches of wit and some interesting jagged edges. At points he was disarmingly modest. "A conductor can inspire, teach, and cajole," he pointed out, but he does not produce the sound. Silently, Barenboim conducted the opening of Beethoven's Fifth Symphony. "Do you hear it?" he asked. "I don't." And he could make a joke at his own expense. "I was once a child prodigy," he said. "The prodigy is gone, but the child has remained."

It was clear that although the United States has been a major arena for his career, he has never felt entirely at home here. Much of his second lecture was about the corruption of the ear through the omnipresence of music not meant to be listened to; he, for one, doesn't want to be presented with the Brahms Violin Concerto in a hotel elevator, especially when he has to conduct that work later in the evening. Addressing a question about the problems of musical education in the United States, he grew angrier and angrier, saying that Americans live in a society without content and context, "an artificial world with artificial vegetables. Next to that, problems of musical education seem very small."

Barenboim was at his best in a postludial meeting with music students after the lectures had been completed; the questions were sharper, the answers wider-ranging, more genial, and far more personal. He described his stay in Cambridge as "not just a teaching experience but a learning experience."

And it probably was. After one of the lectures, there was a question about the decision of the Deutsche Oper to cancel a production of Mozart's opera *Idomeneo* because the stage director had created some images offensive to Muslims that had led to threats. Barenboim's answer began with a remark that won him a laugh ("I am the music director of the *other* opera house [in Berlin]"). Then he became serious: "I don't believe a performance should be canceled because it could be offensive to somebody not required by law to attend."

And within a few days he had written an eloquent and thought-provoking response to the situation, drawing on the thinking in the Norton Lectures. It was widely published in the international press and declared, "Both political correctness and fundamentalism give answers not in order to further understanding, but in order to avoid questions." Maybe, after all, the book of the Norton Lectures is something to look forward to.

—RICHARD DYER

Richard Dyer, A. M. '64, wrote about classical music for the Boston Globe *for 33 years.*

Iambic Imbroglio

Wrangling over the claims of readers—and dead poets

by LELAND DE LA DURANTAYE

In A.D. 19, the Roman noblemen Varius and Tucca were given an extraordinary task: destroy the *Aeneid*. On his deathbed, Virgil asked his friends to burn the manuscript that he had spent the last 10 years of his life working on and that, to his mind, remained unfinished. Tradition recounts that their dilemma was soon resolved: the emperor Augustus, eager for the glory it would bring his reign, demanded publication of the manuscript. Within a few days, dozens of scribes were at work copying out the poem.

A more modern version of this dilemma occurred in 1924, when Franz Kafka, who had published very little during his lifetime, died of tuberculosis in Vienna. He left his unpublished work—novels, stories, parables, epigrams, and fragments—to his friend Max Brod with the instructions that Brod was welcome to read as much as he liked, but had to burn everything when he was done. Brod sat before a fire reading page after page of brilliant, heartrending prose. When at last he was finished, he saw no choice but to disobey his friend's dying wishes.

Recently, the publication of *Edgar Allen Poe & the Juke-Box: Uncollected Poems, Drafts, and Fragments* by Elizabeth Bishop raised the perennial enigma of what to do with manuscripts a writer leaves behind. Alice Quinn, the *New Yorker*'s poetry editor, selected and annotated just over a hundred items from the more than 3,500 pages of Bishop's papers preserved at Vassar College. Many Bishop admirers were delighted to gain access to such a large store of unknown poetry, more than the poet had published during her lifetime. "For those who love Elizabeth Bishop, there can never be enough of her writing," proclaimed John Ashbery '49, Litt.D. '01, on the volume's back cover. "The arrival of this trove of unknown manuscripts is therefore a stupendous event."

BETTMANN/CORBIS

Elizabeth Bishop receiving the 1956 Pulitzer Prize for her collection *Poems: North & South—A Cold Spring*

Not all of the book's readers shared Ashbery's reasoning. Porter University Professor Helen Vendler was quick to point out, in the *New Republic*, that the volume's publication involved more than one questionable decision, beginning with its very title. "Uncollected" suggested materials strewn about in various reviews, periodicals, and the like, whereas what Quinn included were items that Bishop (who taught poetry at Harvard from 1970 to 1977; see "Vita," July-August 2005, page 34) had never published. "Had Bishop been asked whether her repudiated poems, and some drafts and fragments, should be published after her death," Vendler speculated, "she would have replied, I believe, with a horrified 'No.'"

Bishop was particularly sensitive to

GETTY IMAGES

Franz Kafka, Prague, circa 1905

questions of completion and of publication. In contrast, her contemporary Frank O'Hara '50 was famously unconcerned about such matters. His *Lunch Poems* (1964) seem charmingly dashed off, and the best of them have the happy effect of making poetry seem a natural extension of lunch. Friends and admirers gathered O'Hara's disparate compositions (one claimed to have fished some out of his sock drawer) and late in the poet's life, they were published to great acclaim.

In the title poem of the new collection, "Edgar Allan Poe & the Juke-Box," Bishop reminds her readers that "Poe said that poetry was *exact*." For her, too, poetry was a precise endeavor with exacting standards—so exacting that she decided against publishing the title poem itself. In one of her published poems, Bishop has a snail say, "I give the impression of mysterious ease." And in a previously unpublished essay included in the new volume, she notes that "writing poetry is an unnatural act. It takes great skill to make it seem natural." She frequently reworked drafts laid aside for months, years, or even decades. These unfinished fragments and drafts were in some cases kept as mementoes of the past, but just as often they were raw material for the future. What she left behind at her sudden death (of a cerebral aneurysm) in 1979 were many pieces that, given time, she might have revised to meet her standards, but that she had shown no inclination to see published as they were.

In such a case—as with Virgil and Kafka—two forces come into conflict: the wishes of the departed and the wishes of those who remain. Both Vendler and Quinn agree that Bishop would never have consented to the publication of these poems. (Lloyd Schwartz, Ph.D. '76, Bishop's friend and fellow poet, now professor of English at the University of Massachusetts, Boston, and coeditor of the forthcoming Library of America edition of Bishop's poems, suggests that

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Bishop might well have felt "flattered" by such attentions and shown considerable "understanding" for such a decision.) Quinn's introduction stresses how, for Bishop, "meeting her own standards was almost impossible." This is one of the reasons that Ashbery once called Bishop "a writer's writer's writer" and that editors like Katharine White, one of Quinn's predecessors at the *New Yorker*, worked hard to coax poems from Bishop. Quinn offers this same "impossibility" as a rationale for the new collection.

Bishop's mixture of privacy and perfectionism also lies behind the new book's most surprising inclusion—a poem literally *taken* from the author. Lloyd Schwartz was in her hospital room in 1974 when she left for x-rays. During her absence, he looked into her notebook and found himself deeply moved by what he saw there—an erotic poem entitled "Breakfast Song." He recounts, "I had to have a copy. I wanted to read it over and over. I also had the queasy suspicion that if I waited to see the poem in print, I might never see it again." His suspicion proved well-founded; not only did Bishop never publish the poem, but it didn't surface among her papers after her death. Schwartz kept silent about his copy for more than 20 years and then sent "Breakfast Song" to Bishop's literary executrix, who passed it along to Quinn.

Bishop's perfectionism begs the question of whether she really *was* too severe a critic of her own work. Vendler believes Bishop was not too harsh—that, with the exception of a few poems withheld because they are too personal, there are excellent reasons why Bishop chose never to publish the poems found in *Edgar Allen Poe & the Juke-Box*: they pale in comparison to her published work. For Vendler, the new volume not only betrays Bishop's wishes, it betrays the standards of her poetry. Vendler predicted that "the real poems will outlast these, their maimed and stunted siblings," and added, "I am told that poets now, fearing an Alice Quinn in their future, are incinerating their drafts."

Other readers have found more in the collection that they deem just reflections of Bishop's brilliance. Yet the question is not merely *how many* of these poems (two? three? 60?) are of the caliber of her published work; it is what the criteria should be for making such difficult decisions, once the poet herself is no longer there to

GALLERY

Walls of Power

Following the "decisive moment" tradition of Henri Cartier-Bresson, Carlin Wing '02 started out doing New York street photography in high school. One day in a supermarket, she got yelled at for taking pictures without the subjects' permission. "How do you take street photos and ask permission?" she wondered. "Asking permission ruins it." These questions led Wing to consider the invasive or even exploitative nature of the photograph, with this upshot: "I stopped taking pictures of people."

But she didn't stop taking pictures. At Harvard, she pursued a joint concentration in visual and environmental studies (VES) and social anthropology. "Photography grew up in the era of colonialism," she explains. "It was a way to show 'the other.' For a long time, anthropology was about powerful people going somewhere to study people with less power. I think it's also important to study the powerful. You can study corporate culture like any other culture."

As a college junior, Wing began shooting Culture, Inc., a series of photographs of artworks hung in corporate spaces. Unfortunately for photographers, "Places of power have the power to control access," says Wing. "They don't want anyone else interpreting their image. Large companies like Philip Morris and Fidelity would not let me in." Luckily, she had family connections: both her parents are attorneys, and their law firms granted Wing permission to shoot in their offices. (So far, in fact, all the Culture, Inc. spaces have been law firms.) "Corporations buy the majority of art—they have the most wall space. Learning this was a huge shock to me," Wing says. "My photographs juxtapose high art and corporate environments in a way that stands as a metaphor for the relationship between the two."

CARLIN WING

Two photographs from Carlin Wing's series Culture, Inc. depict interiors at law firms.

A top varsity squash player at Harvard, Wing moved to Amsterdam after college and played a couple of years of professional squash on the international circuit. Returning to Cambridge in 2004, she worked as a teaching assistant in VES, and continues competitive squash. (One of her new projects involves shooting glass-walled squash courts at different tournament venues.) Last year, she was one of eight young American photographers included in an international group show, *reGeneration: 50 Photographers of Tomorrow*.

Wing is now a graduate student in photography and media at the California Institute of the Arts. Her new photo series has progressed upward, from shooting walls to shooting ceilings. Ceilings, she reports, are "much less blank than I thought." ~C.L.

make them. There can be no question that the new volume was published with care and intelligence, and in good faith—the question is only in what that faith was placed. We might invest our faith in Elizabeth Bishop's own judgment, or in that of her literary executrix—or in the judgment of Alice Quinn or Lloyd Schwartz, or even of Bishop's worldwide readership. Schwartz, for one, seems to favor the latter: he argues that the literary value of Bishop's best poems is "indestructible," and thus there is no reason not "to err on the side of generosity."

Such generosity may extend, in a way, to future generations of poets. Earlier this year, Louise Glück, former poet laureate of the United States, told an audience at Harvard Hillel that reading the juvenile or unfinished works of great poets had helped encourage and embolden her as a young poet. One can imagine something similar happening for young readers of Bishop's new collection. In its final form, however, her most celebrated poem, "One Art," seems to send a different message. It begins: "The art of losing isn't hard to master;/so many things seem filled with the intent/to be lost that their loss is no disaster." As Bishop made clear, the art of losing—knowing when to hold tight to things, and when to let them go—has much in common with the art of poetry.

Leland de la Durantaye is an assistant professor of English and American literature and language.

Cultural Chaos

From the "dystopian heyday of Maoism" to the making of modern China

by EDWARD S. STEINFELD

Forty years ago, millions of China's urban youth rose up in response to the Great Helmsman's call to "bombard the headquarters." Laying waste to whatever manifestations of revisionism and counterrevolution they could find in their midst—oppressive bonds of authority within schools, parental authority in the household, governmental authority in the person of privileged local party elites—they seized their moment in the revolutionary sun as the vanguard class, furthering historical progress under the banner of Marxism-Leninism-Mao Zedong thought. In the ensuing Cultural Revolution decade, more than a million Chinese citizens would perish and millions more would be injured physically and psychologically. In the process, China's entire social fabric—governmental institutions, the Communist Party organization, the basic urban workplace, the neighborhood, and the family itself—would be torn asunder.

Mao's Last Revolution, by Roderick MacFarquhar, Williams professor of history and political science, and Michael Schoenhals, a lecturer on modern Chinese society at Lund University, in Sweden, provides an unparalleled account of this extraordinary event, one made almost unfathomable, even dreamlike, by the distance China has traveled economically, socially, and even politically since the dystopian heyday of Maoism. In 1966, China's best and brightest, their Little Red Books in hand, converged on Beijing to rally before the Chairman and then spread throughout the country to make revolution, more often than not through internecine violence and wanton destruction. In 2006, China's best and brightest cram desperately to gain entry into the nation's top universities, land jobs with top multinational enterprises upon graduation, achieve professional success, and immerse themselves via the Internet in global flows of information and culture. How times have changed.

At one level, *Mao's Last Revolution* can be read as an historical benchmark, a reminder of how different things once were and, indeed, of just how terrible they became—terrible enough, as MacFarquhar and Schoenhals argue, to have necessitated the sweeping counter-response of Deng Xiaoping's post-Mao reforms.

At a deeper level, however, this brilliant narrative is a reminder of the profound complexity of Chinese society today. As any visitor to Beijing knows, and as every Chinese citizen takes for granted, a gigantic portrait of Mao Zedong still hangs above the central arch of Tiananmen Gate, the geographic fulcrum of Tiananmen Square and the symbolic fulcrum of the seal of the People's Republic of China. MacFarquhar, author of a three-volume history, *The Origins of the Cultural Revolution*, and Schoenhals leave no doubt regarding Mao's culpability for the Cultural Revolution. The Mao of their extensively documented account may not have been a detail-oriented policy person, but neither was he a dreamy utopian, an "ideas man" removed from the darker exploits of those below him who contested viciously for power throughout the Cultural Revolution. Instead, Mao appears as a prophet of mayhem, an active societal instigator driven by an abiding faith in the cleansing

Image ©Andy Warhol Foundation/Corbis

AFP/GETTY IMAGES

Peasants in Hungching engaged in studying and applying "Mao talk" in this 1969 photo.

power of violence and upheaval. He was not only aware by 1967 of his country's having slipped into something resembling civil war, but effectively egged matters on.

As MacFarquhar and Schoenhals further demonstrate through extensive use of original historical documentation, few if any redeemable characters were to be found among China's top-tier officials during the Cultural Revolution. The radical "Leftists" surrounding Mao's wife, Jiang Qing, certainly bore considerable responsibility for the calamitous decade, as the Chinese government's official postmortem on the events concluded in the early 1980s, but so, too, did virtually every other senior official at the time, including even ostensible "victims" like Deng Xiaoping. The one person arguably in a position throughout the duration to temper Mao's excesses, Zhou Enlai, the prime minister, appears to have served more as a facilitator than a brake. The point is that few senior luminaries were purely victims, and almost all of them were in one way or another active participants.

Roderick MacFarquhar and Michael Schoenhals, *Mao's Last Revolution* (Belknap Press of Harvard University Press, $35).

The issue of victimization and culpability leads to an even more significant theme of *Mao's Last Revolution*. The Cultural Revolution, as MacFarquhar and Schoenhals demonstrate, should not be understood as something akin to a Stalinist purge. It did not operate through the proverbial midnight knock on the door, the unannounced visit by the state security apparat assigned to round up designated victims and "disappear" them into eternity. Rather than a carefully orchestrated purge or even a carefully coordinated manipulation of public sentiment, the Cultural Revolution was a wildly unpredictable and intensely participatory event, something that reached into the deepest interstices of civic life and, in so doing, took on a momentum and trajectory of its own. Mao's repeated proclamation that "rebellion is justified" stoked intense passions among ordinary people, whether the young or, frankly, anybody else harboring feelings of resentment, dissatisfaction, and envy—which is to say, virtually everybody. People were stirred to participate and participate violently. Mao's directive to "bombard the headquarters" may have been a figurative call to attack revisionists within the central Communist Party bureaucracy, but it translated in the citizen's mind as license to attack any semblance of social hierarchy and authority, the closer and more personal the better.

Opting out of politics may not have been an option in the totalitarian context of Maoist China, but during the Cultural Revolution, many, many citizens rushed to join in voluntarily. Indeed, many Chinese today can still recall the initial sense of euphoria, liberation, and exhilaration that accompanied their participation in the movement. Many, too, look back in wonder, and often horror, at what they did and how eagerly they did it. The Cultural Revolution would be an easier event to understand if clearer boundaries existed between victims and victimizers. Instead, it is a difficult period to comprehend precisely because most Chinese citizens who lived through it were both. Tragically, it is, in this sense, *their* event—not something they simply suffered through, but rather something they *own*.

And that brings us back to the portrait of Chairman Mao on Tiananmen Gate. In the 30 years since Mao Zedong's death and the end of the Cultural Revolution, China's reformist leaders have dismantled virtually every vestige of Maoist policy. China today in almost every way—save for the monopoly on political authority still claimed by Party—represents a rejection of Maoism, and arguably even socialism. As outsiders, then, it becomes easy for us at once to view contemporary China as a repudiation of the past and to wait expectantly for the citizenry to cast off the government that victimized them in the past and still lionizes Mao Zedong in the present. Yet for Chinese citizens, just as the Cultural Revolution is their own, so, too, is Mao Zedong and the Chinese Revolution more broadly. Their revolution's track record is undoubtedly ambivalent, encompassing the full gamut from exhilarating liberation to grotesque calamity, but—in the minds of many—it is an event still in the process of unfolding. The economic burgeoning and global presence of China today is, for many Chinese, as much a part of that revolution as the portrait of Mao Zedong on Tiananmen Gate, and the wrenching historical events to which that portrait is linked.

To read *Mao's Last Revolution*—an unsurpassed account of an era at once gone by and still so present in the minds of Chinese citizens today—is to come face to face with the complexities of political legitimacy, historical memory, and the evolving social contract in what has become one of the world's most influential nations.

Edward S. Steinfeld '88, Ph.D. '96, associate professor of political science at MIT, focuses on the political economy of China. His current research projects examine contemporary Chinese industrial competitiveness and the management of China's energy sector. As a Harvard senior, he took Roderick MacFarquhar's "Cultural Revolution" course (Foreign Cultures 48) in its inaugural year.

New England

REGIONAL SECTION

Extracurriculars

Defy the winter doldrums: attend a gospel concert, take kids to see *Oliver Twist*, or dip into the diverse array of exhibits on offer. This season, museums and libraries in and around Harvard Square provide a wide range of close looks at people (Leonard Bernstein and H.W. Longfellow), places (New England and the Arctic), and things (Peruvian pottery and Islamic metalwork.)

SEASONAL

Gospel Tribute to the Kings

• January 13 at 8 P.M.
www.boxoffice.harvard.edu; 617-496-2222
Sanders Theatre
"Joyful Noise 2007," an annual gospel concert featuring the Harlem Gospel Choir, celebrates the legacy of Dr. Martin Luther King Jr. and offers a special memorial tribute to Coretta Scott King.

Valentine's Jam

• February 16 at 8 P.M.
www.boxoffice.harvard.edu; 617-496-2222
Sanders Theatre
The ***Radcliffe Pitches*** join the ***Harvard Krokodiloes*** in this annual a cappella Valentine's Day concert.

THEATER

The American Repertory Theatre

www.amrep.org; 617-547-8300
• Through January 13
The Onion Cellar, a musical mystery, features the Dresden Dolls, a punk cabaret duo from Boston. Conceived by Amanda Palmer and Marcus Stern.
• Through January 14
The Importance of Being Earnest. The American premiere of the Oscar Wilde play as performed by Ridiculusmus, an avant-garde British group. Directed by Jude Kelly.
• January 20-February 11
Britannicus, by Jean Racine, is a political thriller and family drama set during Nero's reign. Directed by Robert Woodruff.
• February 17-March 24
In *Oliver Twist,* Neil Bartlett's staging of the Dickens classic offers a vivid depiction of nineteenth-century London and a child's perilous journey through it.

FILM

The Harvard Film Archive

http://hcl.harvard.edu/hfa
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617-495-4700
• January 5 to February 19
Jacques Rivette: A Differential Cinema explores the major works of this French New Wave director, combining such popular films as *Celine and Julie Go Boating* with lesser known works, such as *Duelle* and *The Story of Marie and Julien.*
• January 19-31
The seventh annual ***New Films from Europe Festival*** offers works by filmmakers who challenge prevailing notions of national identity and push the boundaries of formal convention.
• February 6-28
Poetic Horror, Pop Existentialism, and Cheap Sci-Fi: Cold War Cinema 1948-1964. Curated by the visiting lecturer and critic J. Hoberman, this series explores postwar tensions in the United States.
• February 20-27
The Lives of Others: Selected Films of Helmut Käutner presents a rare sampling of Käutner's film work both during and after World War II.

Left to right: *Red Menace*, 1949, is part of the February film series *Poetic Horror, Pop Existentialism, and Cheap Sci-Fi: Cold War Cinema 1948–1964* at the Harvard Film Archive; *Flux Year Box 2*, late 1960s, mixed media, on display at the Busch-Reisinger Museum starting February 24; a scene from *Oliver Twist*, at the American Repertory Theatre from February 17 through March 24.

FROM LEFT TO RIGHT: COURTESY OF HARVARD FILM ARCHIVE; COURTESY OF THE HARVARD UNIVERSITY ART MUSEUMS, © PRESIDENT AND FELLOWS OF HARVARD COLLEGE; COURTESY OF THE AMERICAN REPERTORY THEATRE

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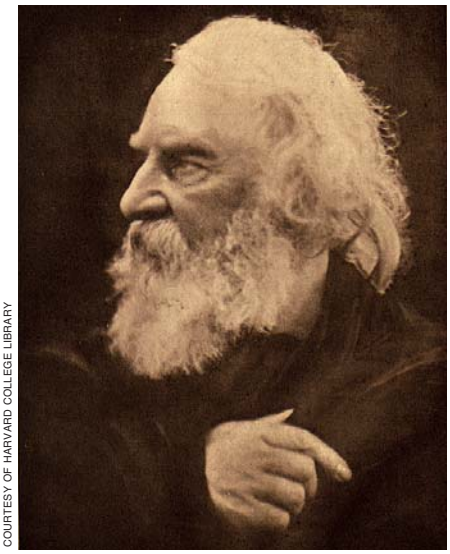

COURTESY OF HARVARD COLLEGE LIBRARY

This photogravure print of H.W. Longfellow (c. 1893) by Julia Margaret Cameron is on display at Houghton Library starting January 16.

LIBRARIES

www.hcl.harvard.edu/libraries

Houghton Library 617-496-3359

• Opening January 16

Public Poet, Private Man: Henry Wadsworth Longfellow at 200.
The exhibition offers a new look at the poet's connection with his audience, and his efforts to expand the international dimension of American literature.

• Continuing: ***Leonard Bernstein's Boston,*** which explores the composer's historic ties to musical and educational communities in and around the city.

Cabot Science Library

• Closing January 23

Envisioning the Landscape provides a geological glimpse of the New England countryside, notably Cape Ann, Martha's Vineyard, and parts of Maine.

Pusey Library 617-495-2413

• Continuing: ***Theodore Roosevelt: Imagery for a President.*** Photographs and cartoons illustrate key themes and slogans from TR's administrations.

Schlesinger Library

www.radcliffe.edu/schles; 617-495-8647

• February 7 at 6 P.M.
The screening of *A Place of Rage*, a documentary film about African-American activists by Pratibha Parmar.

• February 20 at 4 P.M.
Barry Gewen, an editor at the *New York Times Book Review*, discusses the role of books and culture in contemporary life.

• Continuing: ***Images of Women: Selections from the Collection of Sally Fox.*** The prolific photographer and researcher, who died in February, documented women's lives around the world.

EXHIBITIONS

Peabody Museum of Archaeology and Ethnology

www.peabody.harvard.edu; 617-495-1027

• Closing February 27

Michael Rockefeller: New Guinea Photographs, 1961. This exhibit of black-and-white images, most of which have never been publicly displayed, documents the life of the Dani people in the Baliem Valley (today part of Indonesia). Rockefeller '60 took more than 3,500 photographs during the Peabody Museum's New Guinea Expedition (1961-1963).

• Continuing: ***The Moche of Ancient Peru: Media and Messages.*** The display of more than 100 objects, principally ceramic pieces, explores one of South America's most complex early societies.

Harvard Museum of Natural History

www.hmnh.harvard.edu
617-495-1027

• Closing January 7

Looking at Landscape: Environmental

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A composite photograph of the Andromeda galaxy. Learn more about stars and space during Observatory Nights at the Harvard Center for Astrophysics.

FULFILL

When corporate life left Sarah Piccioli longing for more, she took a psychology course at Harvard Extension School. Today this former trading analyst has a new life in academia—and plans for a PhD.

Piccioli is pursuing the Master of Liberal Arts in psychology.

INVEST

Because Internet entrepreneur Robin Low understands the importance of marketing savvy, he's spent countless evenings in management courses at Harvard Extension School, honing the skills to make his company a success.

Low owns Greenyarn, a manufacturer of eco-friendly fabrics. See www.greenyarn.com.

PURSUE

Wendy McTyre is a designer by training and an environmentalist at heart. In environmental studies at Harvard Extension School, she's finding ways to combine her experience and passion to pave a new career path.

McTyre is pursuing the Master of Liberal Arts in Environmental Management.

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COURTESY OF HUAM, © PRESIDENT AND FELLOWS OF HARVARD COLLEGE

This image of women at work at the H.J. Heinz Company in Pittsburgh (ca. 1900) is on display at the Sackler starting on January 20.

Puzzles from Three Photographers. Visitors can decipher themes in American landscapes through noting scale, color, patterns, and other visual cues in works by Alex S. MacLean, Anne Whiston Spirn, and Camilo José Vergara.
• Opening January 27

Echoes in the Ice: Collages of Polar Explorers. Visual artist and filmmaker Rik van Glintenkamp melds archival imagery, writings, and reproductions of personal memorabilia into collages that depict Arctic and Antarctic explorations that span nearly four centuries.
• March 18, at 2 P.M.

www.boxoffice.harvard.edu; 617-496-2222
Tickets go on sale February 27 to hear ***Jane Goodall*** speak at Sanders Theatre; she will also be awarded the 2006 Roger Tory Peterson Medal. A book signing by Dale Peterson, author of *Jane Goodall: The Woman Who Redefined Man,* follows the lecture.
• Continuing: ***Arthropods: Creatures That Rule*** is a multimedia exhibit that looks at how these creatures—insects, spiders, crustaceans, and centipedes—have evolved over 500 million years. Includes fossils, specimens, photographs, and video presentations.

Semitic Museum
www.fas.harvard.edu/~semitic/
617-495-4631
Continuing: ***The Houses of Ancient Israel: Domestic, Royal, Divine*** features a full-scale, furnished replica of a two-story Iron Age (ca. 1200-586 B.C.E.) village house; ***Nuzi and the Hurrians*** details everyday life in northern Mesopotamia ca. 1400 B.C.E. Also on display are ancient Cypriot artifacts from the Cesnola Collection.

Hammond Residential

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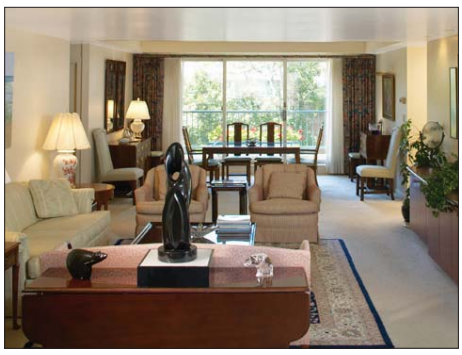
Cambridge...On the river in Harvard Square in a handsome 1920's brick building with resident staff and elevator. Spacious one-bedroom condo with large living/dining room, oak floors, dado moldings, breakfast area. Perfect pied-à-terre! $358,000

Arlington...This delightful 3-bed, 2-bath custom ranch is just steps to the Stratton School and a short walk from transportation. The spacious living room, with its wide 7-panel bay window and fireplace, opens to the dining room with a custom built-in china cabinet. Off the eat-in kitchen is a 3-season porch. The ground level lends itself to an in-law solution. $499,000

Cambridge...Loft #227, 1,436 sq. ft. Dramatic 2BR/2BA loft on a secluded way in West Cambridge. Massive windows. Fully finished kitchen with Bosch appliances, granite countertop and custom wood cabinets. Professionally managed building with deeded parking. Pet friendly. Visit www.aberdeenlofts.com for information regarding other available units. $595,000

Belmont...Inviting Brick Colonial. Payson Park, near library, "T" to Cambridge, and across from Oakley CC. Vintage 1930's detail. $749,000



Cambridge... Rare floor-through condominium in sought-after Harvard Square doorman building. Four bedrooms, four baths. Sunny, large spaces. Several exposures. Two balconies, two garage parking spaces. $2,300,000

Cambridge... Parisian elegance in Mid-Cambridge. Top floor of French Second Empire. Skyline views. Cook's kitchen. 8Maple.com. $849,000

Cambridge...Huron Village. Tastefully renovated two bedroom, one bath condominium. Gleaming hardwood floors, in-unit laundry, great closet space and back porch. www.9GranvilleRd.com. $445,000

Belmont...Stone Estates. Walk to schools and town center. Well-preserved 1912 Craftsman-style single. 8 rooms, 2-car garage. Large, lovely lot. $745,000

Cambridge...West. Stunning 3 BR/2BA condo. Sun-filled open floor plan w/pretty detail, high ceilings, wood flrs. Private deck. Garage pkg. Near golf, tennis & jog trails. $619,000

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COLLAGE BY RIK VAN GLINTENKAMP

An exhibit about polar explorations during the last 400 years opens on January 27 at the Harvard Museum of Natural History.

Busch-Reisinger Museum

617-495-2317

• Opening February 24

Multiple Strategies: Beuys, Maciunas, Fluxus. This show stages a dialogue between the artists, both of whom sought to erase the boundary between art and life.

Fogg Art Museum

617-495-9400/9422

• Closing February 11

"A Public Patriotic Museum"—Artworks and Artifacts from the Artemus Ward House includes paintings, furniture, textiles, and agricultural tools associated with Ward, general of the colonial militia that besieged Boston before George Washington took command.

• Closing February 25

DISSENT! presents dozens of printed images that express resistance to religious, political, and social systems, demonstrating the role of printmaking in disseminating opinions.

Sackler Museum

617-495-9400/9422

• Opening January 20

Classified Documents: The Social Museum of Harvard University, 1903-1931. Established as a cornerstone of the then-new department of social ethics, the museum aimed to "collect the social experience of the world as material for university teaching." The surviving collection contains more than 4,500 photographs and nearly 1,500 illustrations, a portion of which are now on display.

• Continuing: ***Overlapping Realms: Arts of the Islamic World and India, 900-1900.*** A sampling of art, primarily ceramics and metal work, produced by people inhabiting a region that stretched

from southern Europe through South Asia. Phase two of the exhibit, which incorporates photographic arts, begins February 25.

NATURE AND SCIENCE

The Harvard-Smithsonian Center for Astrophysics
www.cfa.harvard.edu/events.html
617-495-7461
Phillips Auditorium, 60 Garden Street
Stargaze and learn about the planets on the third Thursday of every month. Free and open to the public.
• January 18 at 7:30 P.M.
"The Great Observatories Look at Andromeda," by astronomer Pauline Barmby.
• February 15 at 7 P.M.
Smithsonian astronomer Andrew Szentgyorgi talks about ***"Hunting for Extrasolar Planets."***

MUSIC

Jazz Festival
• February 16 at 7:30 P.M.
www.harvardclub.com; 617-536-1260
The main Harvard Club of Boston (374 Commonwealth Avenue) hosts the Jazz Combo Festival, in which student groups perform three works to compete for prizes. Free and open to the public.

Sanders Theatre
www.boxoffice.harvard.edu
617-496-2222
• January 21 at 2:30 P.M.
The a cappella ***St. Olaf Choir,*** comprising 75 mixed voices, performs.
• February 3 at 8 P.M.
Enjoy an evening of soulful songs with ***Kathy Mattea*** and her five-piece band.
• February 4 at 2 P.M.
The ***Boston Conservatory*** presents an afternoon program of Dvořák, Mozart, and Shostakovich.
• February 10 at 8 P.M.
The ***Gyuto Monks*** are a Tibetan choir renowned for multiphonic singing and Buddhist tantric rituals.
• February 22 at 7:30 P.M.
and February 25 at 3 P.M.
The ***Boston Philharmonic Orchestra*** performs works by Beethoven and Sibelius.

Events listings also appear in the *University Gazette*, accessible via this magazine's website, www.harvardmagazine.com.

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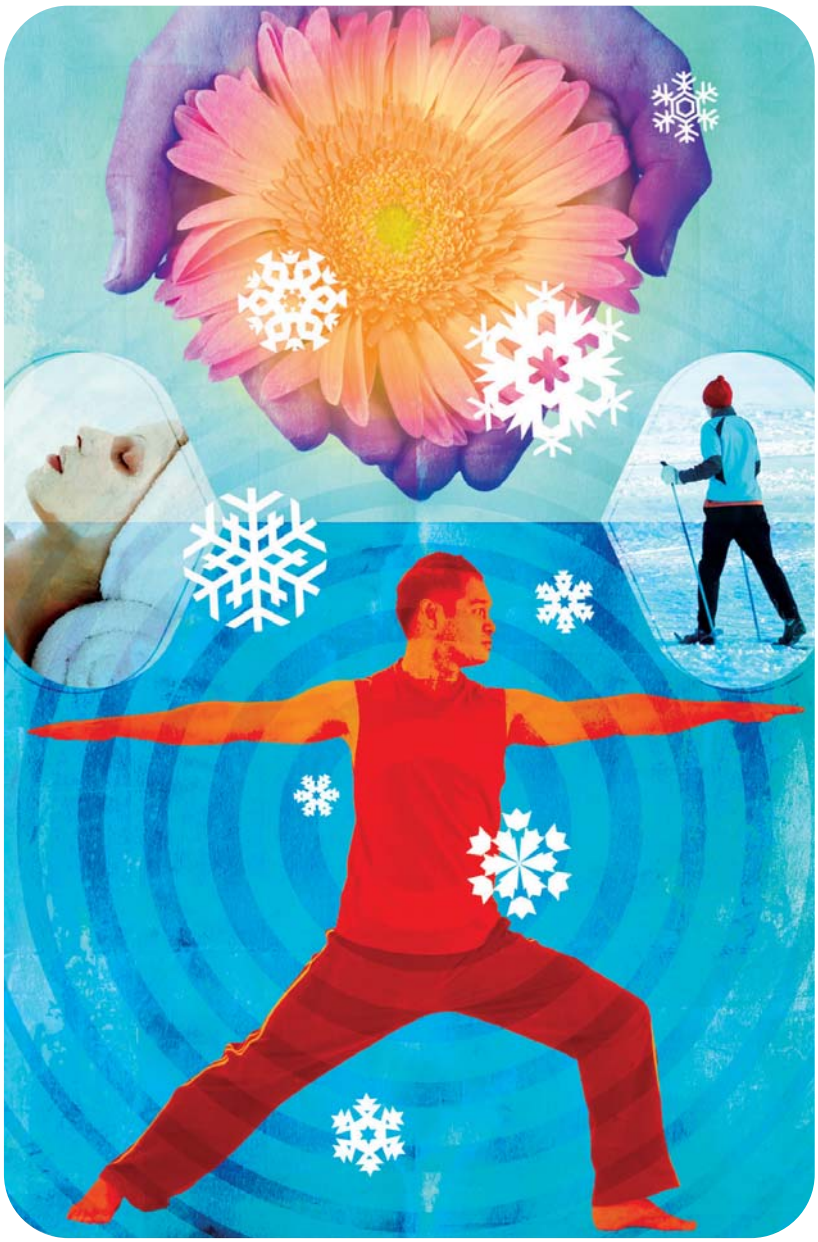
Winter Wellness

How to stimulate heart, mind, and soul when it's cold outside • by Nell Porter Brown

In recent years, University Marshal Jacqueline O'Neill and her daughter, Leigh, have spent part of the week between Christmas and New Year's Day at the Canyon Ranch resort in Lenox, Massachusetts. The tradition began when Leigh was in college. "It's not so much about the beauty treatments as it is about recovering from the rush of the holidays and carving out time to be with each other," O'Neill says. "This was our way to reconnect." She also considers this winter escape from daily life to be "a good investment in my health. We like to do a little bit of everything. The hikes are great. Pool aerobics are fun. But the 9 p.m. massages right before bed are the best. You only have to be there half a day and you're in another world. You really unplug."

Wintertime in New England can be hard on almost everyone. But just because it's cold outside doesn't mean that the region's citizens must hide under heavy clothes and coverlets, bemoaning the darkness at 5 p.m., until the crocuses bloom. "Spring is the time of creation and we see that all around us in the environment, as things begin to grow," says Keli Ballinger, director of the University's Center for Wellness and Health Communication. "But I think we would serve ourselves well by developing that same sense of growth during the wintertime as well."



This is especially true because opportunities for "winter wellness" abound. Throughout the region, there are spas, yoga retreats, sanctuaries, and lodges where one can soothe the soul, revive the flesh—and even stimulate the mind.

Canyon Ranch, which also offers specialized health and fitness programs, is among the best-known spa resorts in the area. Other top-rated organizations include the nearby Cranwell resort and golf club (partly owned by Daniel Burack, M.B.A. '57); the Topnotch Resort and Spa in Stowe, Vermont, which makes a point of offering spa services to men; The Spa at Norwich Inn (near the Connecticut coastline); and Wentworth by the Sea, which is located just outside of Portsmouth, New Hampshire.

Wentworth happened to be the site of a recent three-day invitation-only symposium on global financial regulations held by the Program on International Financial Systems at Harvard Law School. After running around in three-inch heels and taking care of 122 people for 15 hours a day, administrator Katie Bosley says her feet were numb

Illustration by Stuart Bradford

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and her calf muscles tied in knots. So she got a massage at the hotel's spa. "I was just happy to be lying down," she says. Her colleague, Judith Polgar, who does not ordinarily go in for body treatments, got a deluxe manicure. "The buffing, the creaming, the massaging of the hands and lower arms, and the soaking of the hands in warm paraffin—it's all very relaxing," she allows. "I fell asleep."

For those interested in more physical exertion, or gaining self-knowledge, the Kripalu Center for Yoga and Health (also located in Lenox) offers regular, year-round "retreat and renewal" yoga programs along with dozens of more specialized mind/body awareness workshops and programs by guest instructors.

"Almost two weeks of complete silence…leaves you feeling peaceful and released."

For a rigorous meditation retreat, Gregory Sulkowski '00, M.D. '04, recommends the Vipassana Meditation Center in Shelburne, Massachusetts. He and his wife, Sunana Sohi '00, who live in Chicago, took time out of their medical residencies in 2005 to do a 10-day silent meditation practice. Men and women were separated. Books, music, phones, and writing materials were banned. And no eye contact—or even gesturing—with others was allowed. "It's not a spa; it's not your typical restful getaway," cautions Sulkowski. They awoke at 4 A.M. and spent their days in various physical postures concentrating on breathing and sensation, with few distracting external stimuli.

"The course itself is mentally grueling," he reports. "But all that said, almost two weeks of complete silence without e-mail, phones, or even anyone talking to you truly leaves you feeling peaceful and released." The retreat's effects have seeped into the couple's busy regular lives: they still practice yoga and meditate when they can—even

on the subway, or in bed before falling asleep. "I think Vipassana can be used as a general approach to managing one's reactions and mental outlook," Sulkowski says. "I consider it to be the single most important tool I have learned to help maintain my happiness and striving for greater wisdom."

If sitting still isn't alluring, there are plenty of places that cater to outdoor play and sports. The Craftsbury Outdoor Center in northern Vermont is a great vacation-lodge destination for individuals as well as families. In the warmer months, the center is best known for its sculling and running camps, although it also provides general activities such as lake swimming, hiking, and mountain biking. But in the winter, the center focuses on cross-country skiing for all ages and levels; serious athletes also train there.

Anna Schulz '09, a member of the Harvard cross-country Nordic team, grew up in Vermont and has gone to Craftsbury for more than a decade. "It's out in the woods on a little dirt road. It's beautiful—Vermont at its finest," she says. "It's geared more toward doing things outside and having a great vacation through being healthy and enjoying the outdoors, rather than having breakfast in bed in a hotel. But I must say that they do have wonderful food." Schulz and her family, all of whom ski, participate in races at the center, go snowshoeing, and skate and play hockey on the iced-over lake. "They have a really good ski-school program," she reports, "and they even host Elderhostel programs, so you're out there with everyone from the 80-year-olds to the kids who are just learning how to cross-country ski."

Winter activities do not have to be expensive—or even very far afield. The Wellness Center, which is part of the University Health Services, offers its own treatments, classes, and workshops, from body therapies (such as massage, acupuncture, and reiki—hands-on healing) to yoga, t'ai chi, and Pilates. There is even a new "knitting for wellness" group.

Harvard graduate student Stephanie Aktipis, who studies the evolution of marine snails, took that four-session class last October just because she'd always wanted to know how to knit. "The wellness part completely flew over my head until they started talking about it in class," she says. The teacher read excerpts from books on mindfulness and elicited thoughts and feelings from the group as they purled away. Aktipis is now making a cobalt-blue scarf for a friend, and often knits while watching television or before bedtime. "I haven't become one with my knitting," she says, with a laugh. "But knitting definitely helps me relax—when it's going well. I find that I really enjoy the chance to empty my mind of the day's craziness and focus only on the rhythm of the knitting.... There is something soothing about it."

The Wellness Center also offers a lending library of nonfiction videos and DVDs that feature classes on belly dancing and salsa dancing, among other activities. "Learning something new is another way to revitalize ourselves," says Ballinger. Commuters take note: Why not make use of all those hours in the car or on the train to learn a new language? she asks. (Schoenhof's Foreign Books in Harvard Square has a wealth of information and resources on language-learning, and companies like Pimsleur Direct offer comprehensive audio learning systems.)

Or why not absorb lectures on math, science, art, or philosophy? The Teaching Company, founded in 1990 by Thomas M. Rollins, J.D. '82, offers more than 200 recorded lectures by Ivy League and other university professors around the country, with notes and syllabi, to foster excellence in lifelong learning. The catalog is "a wish list come true for intelligent adults everywhere who wish they could study those things we cared passionately about as undergraduates, but that we couldn't pay attention to anymore after college because we had to go out and make a living," he says. "I was a passionate philosophy student and, trust me, once I got into law and started running a business, philosophy fell by the wayside."

Rollins himself is traveling to Italy next year and recently downloaded the "History of the Renaissance" into his iPod. "Italy will be a vastly richer experience because of that study," he says. "These lectures can be a marvelous complement to a life of exploration and adventure—and a joy for the life of the mind." ∇

Nell Porter Brown is the assistant editor of this magazine.

Winter Wellness Resources

Canyon Ranch Resort 800-742-9000, www.canyonranch.com

Craftsbury Outdoor Center 802-586-7767, www.craftsbury.com

Cranwell 413-637-1364, www.cranwell.com

Kripalu Center for Yoga and Health 866-200-5203, www.kripalu.org

The New England Wellness Web directory www.newellness.com

Pimsleur Direct www.pimsleurdirect.com

Schoenhof's Foreign Books 617-547-8855, www.schoenhofs.com

The Spa at Norwich Inn 800-275-4772, www.thespaatnorwichinn.com

The Teaching Company 800-832-2412, www.teach12.com

Topnotch Resort and Spa 800-451-8686, www.topnotchresort.com

University Health Services/Center for Wellness 617-495-9629, http://huhs.harvard.edu/CWHC/WellnessPrograms/CWHCWellnessPrograms.htm

Vipassana Meditation Center www.dhamma.org

Wentworth by the Sea 603-422-7322, www.wentworth.com

Freshly French

Dinner at Lumière brightens up a winter night.

Above: The clean lines shine, along with the food, in Lumière's elegant dining room.

Chef Michael Leviton is sometimes called a perfectionist. "Not true; I don't think perfection is attainable," he explains. "That being said, I do want things to be very, very good—every single day." And so they are. Rarely is a restaurant as seamless—from the spare, but warm, whiteness of its interior to the diamond-fine clarity of its French fare—as Lumière, Leviton's fiefdom.

The walls are bare but for a long strip of mirror that reflects the candle-lit tables. White muslin hangs like low-flying clouds from the ceiling, along with a few copper-mesh lamps, which give the restaurant an appealing glow—especially on a cold, windy night. (Lumière, which sits across the street from the West Newton Cinema, means "light" in French; the name also pays homage to the Lumière brothers, pioneer filmmakers in the late 1800s.)

Leviton and his then-wife opened the restaurant in 1999, shooting for "a sophisticated little two-star downtown New York restaurant" in the Boston suburbs. "Back then, people had a lot of money," he adds, and they spent it on things like truffle vinaigrette and *foie gras*—neither of which is now on the menu. The dressing he dismissed as "laboratory-created perfume." And the luxury liver was nixed after a trip to the relatively humane Niman Ranch hog farm in Iowa. "I saw happy pigs running around in the field," Leviton says, "and it occurred to me that a goose will naturally fatten itself, but is not going to fatten itself so much that its liver weighs a pound and a half."

These days, his constantly evolving menu reflects what is freshest, local—and naturally raised. A Long Island-bred duck was turned into a pistachio-laced terrine with caramelized apple mustard, parsley salad, and sourdough toast points ($10). The soup of the day ($10), which featured heirloom "Georgia candy roaster squash" spiced simply with cinnamon and nutmeg and dashed with a little cream, was a pure, earthy essence.

The Moroccan chicken with roasted peppers and black olives ($24) fell off the bone, mingling with the broth-soaked couscous and just the right amount of salt. And the tender Northeast Family Farms hanger steak ($30) rested on a mélange of roasted carrots, capers, pine nuts, and a few raisins. Each dish was stylishly arrayed on plain white plates alongside a basket of hot, house-made white bread (so good that we asked for more). "The fundamental aesthetic of many cuisines, if not all," Leviton says, "is that you want something simple and pure and in harmony with the season, so that's what I try to do." With more than 80 wines on the menu, some pairings are recommended: the Spanish Artazuri went beautifully with the stewed chicken.

For dessert, we'd suggest the buttermilk panna cotta with dried-fruit maple compote ($8) for its subtle sweetness and flawless texture. The caramelized apple tart, with small cubes of soft, sugary apples and raisins atop chewy pastry, was a clear nod to late fall, and was served with a dreamy cinnamon ice cream ($9).

"If I had my choice," Leviton says of the food *he* loves, "I'd drop myself in the south of France and eat there the rest of my life—with occasional forays into Southeast Asia." Maybe this winter we'll just travel back to West Newton. ~N.P.B.

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Psychology explores humans at their best.

by CRAIG LAMBERT

This doesn't feel like a normal academic conference. True, the three-day Positive Psychology Summit is a sellout, with 425 attendees thronging the meeting rooms in downtown Washington, D.C. But despite the familiar trappings, something seems different. There's herbal tea available at breaks, and the conference's organizer, Shane Lopez of the University of Kansas, walks around smiling and ringing a dinner bell to prompt people to take their seats for the next session. This group is slimmer, healthier, younger, and more female than the usual scholarly crowd. Some stretch in yoga-like postures in the aisles, or recline on friends' bodies as if resting on a chaise longue. The professional jargon includes recurring words like *flow, optimism, resilience, courage, virtues, energy, flourishing, strengths, happiness, curiosity, meaning, subjective well-being, forgiveness,* and even *joy*.

But the main difference probably shows up in the question periods. Typically, academics seem obsessed with poking holes in the argument of the presentation just made—finding fault, pointing out counter-examples, insisting on qualifications—with the transparent purpose of one-upping the speaker. Such shenanigans are absent here. "They're trying to *build*," explains one participant. "There's none of this academic carping," observes professor of psychiatry George Vaillant, who has spoken at five of these "summit" events. "The teaching exercises I've done for positive psychology audiences have been an absolute joy. Here, people really laugh at the jokes."

This October morning, they are laughing with Tal Ben-Shahar '96, Ph.D. '04, an associate of the Harvard psychology department, who argues in his opening keynote address that positive psychologists need to build bridges between "the ivory tower and Main Street," to unite academic rigor with the accessibility of popular psychology books. "Most people do not read the *Journal of Personality and Social Psychology*," he notes. "In fact, one of my colleagues at Harvard did a study, and he estimated that the average journal article is read by seven people. And that includes the author's mother."

Ben-Shahar is a psychologist and author who has never pursued a tenure-track position nor published research in professional journals (even so, his third book, *Happier: Finding Meaning, Pleasure, and the Ultimate Currency,* is due this spring). Ben-Shahar's passion is teaching, and he goes on to explain how he teaches positive psychology. His Harvard course on the subject has been offered twice, in 2004 and in 2006, when its enrollment of 854 students was the largest of any course in the catalog, surpassing even introductory economics. This startling fact seized the attention of national media, and pieces about "Happiness 101" (actually, Psychology 1504, "Positive Psychology") appeared in the *Boston Globe* and on CNN, CBS, National Public Radio, and overseas in the *Guardian*, the *Jerusalem Post*, and the *Shanghai Evening Post*, making Ben-Shahar one of the best-known positive psychologists alive. At 36 years of age, he is a young star in a field that is only eight years old.

For much of its history, psychology has seemed obsessed with human failings and pathology. The very idea of psychotherapy, first formalized by Freud, rests on a view of human beings as troubled creatures in need of repair. Freud himself was profoundly pessimistic about human nature, which he felt was governed by deep, dark drives that we could only tenuously control. The behaviorists who followed developed a model of human life that seemed to many mechanistic if not robotic: humans were passive beings mercilessly shaped by the stimuli and the contingent rewards and punishments that surrounded them.

After World War II, psychologists tried to explain how so many ordinary citizens could have acquiesced in fascism, and did work epitomized in the 1950 classic *The Authoritarian Personality* by T.W. Adorno, et al. Social psychologists followed on, demonstrating in laboratories how malleable people are. Some of the most famous experiments proved that normal folk could become coldly insensitive to suffering when obeying "legitimate" orders or cruelly sadis-

Photographs by Jim Harrison

tic when playing the role of prison guard. Research funders invested in subjects like conformity, neurosis, and depression.

A watershed moment arrived in 1998, when University of Pennsylvania psychologist Martin Seligman, in his presidential address to the American Psychological Association, urged psychology to "turn toward understanding and building the human strengths to complement our emphasis on healing damage." That speech launched today's positive psychology movement. "When I met Marty Seligman [in 1977], he was the world's leading scholar on 'learned helplessness' and depression," says Vaillant. "He became the world's leading scholar on optimism."


Tal Ben-Shahar

Though not denying humanity's flaws, the new tack of positive psychologists recommends focusing on people's strengths and virtues as a point of departure. Rather than analyze the psychopathology underlying alcoholism, for example, positive psychologists might study the resilience of those who have managed a successful recovery—for example, through Alcoholics Anonymous. Instead of viewing religion as a delusion and a crutch, as did Freud, they might identify the mechanisms through which a spiritual practice like meditation enhances mental and physical health. Their lab experiments might seek to define not the conditions that induce depraved behavior, but those that foster generosity, courage, creativity, and laughter.

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>
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Seligman's idea quickly caught on. The Gallup Organization founded the Gallup Positive Psychology Institute to sponsor scholarly work in the field. In 1999, 60 scholars gathered for the first Gallup Positive Psychology Summit; two years later, the conference went international, and ever since has drawn about 400 attendees (the maximum for the meeting space, Gallup's world headquarters) annually. The October conference-goers represented 28 countries, 70 businesses or foundations, and 140 educational institutions.

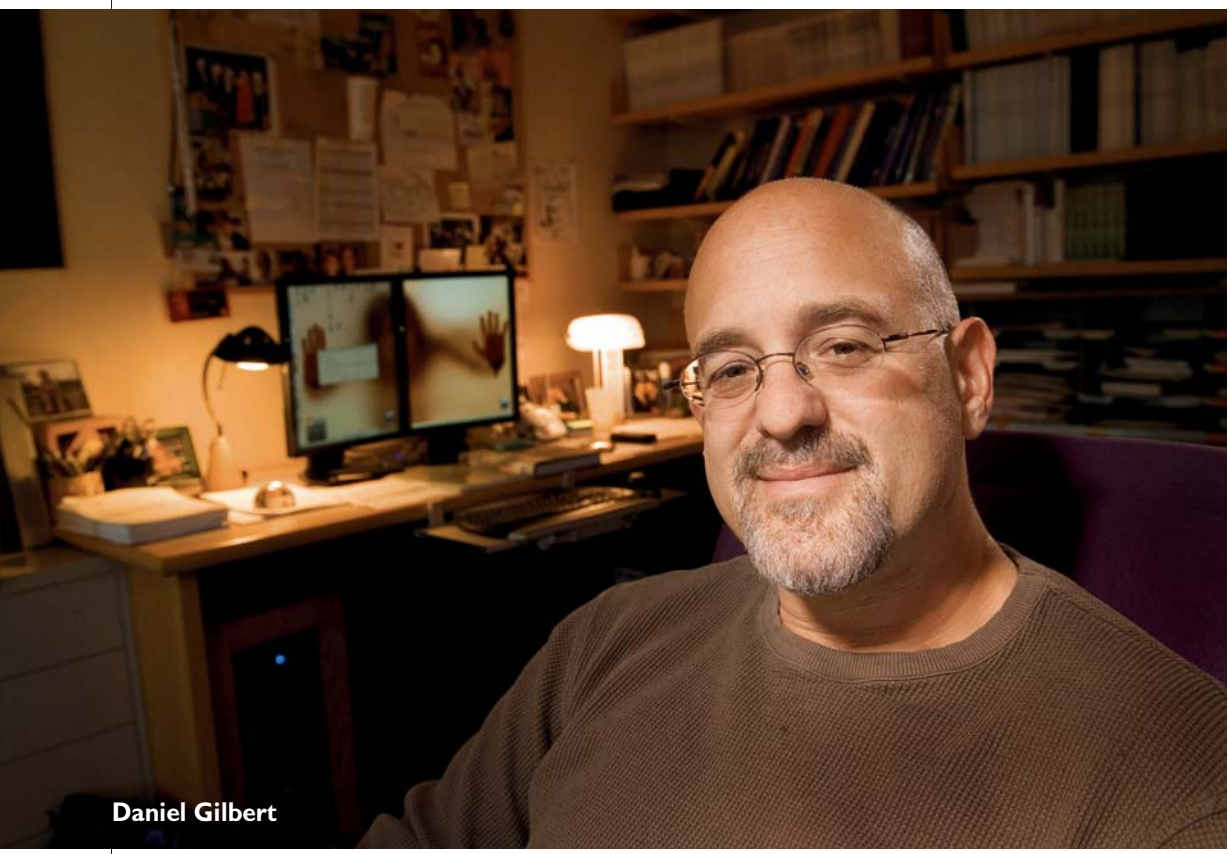
Teaching has mushroomed, too. In 1999, the late Philip J. Stone, professor of psychology at Harvard, taught a positive psychology course to 20 undergraduates. There were hardly any college courses on the subject then; seven years later, there are more than 200 across the United States. The University of Pennsylvania offers a master's degree in the field. International growth, too, is strong. Recently, Ben-Shahar gave seminars in China on the relationship of positive psychology to leadership, and he says "interest from Chinese educators and media was huge."

The field's roots go back at least to 1962, when Brandeis psychologist Abraham Maslow wrote about what a human life could be at its greatest in *Toward a Psychology of Being.* His "humanistic psychology" became the discipline's "third force," following psychoanalysis and behaviorism. "The fundamental difference between humanistic psychology and positive psychology is in their relationship to research, epistemology, and methodology," says Ben-Shahar. "Many who joined the 'Third Wave' were not rigorous. Humanistic psychology gave birth to the self-help movement, and lots of self-help books have come out with concepts grounded in emotion and intuition. Positive psychology combines those things with reason and research."

Doing so apparently answers needs the first and second forces have left unsatisfied. "I'm in a department of psychiatry, and psychiatry does not have a good model of mental health," says clinical instructor in psychology Nancy Etcoff, who is based at Massachusetts General Hospital (MGH). "Is there a model of mental health beyond 'no mental disease'?" Vaillant, a psychiatrist and a trained psychoanalyst, says, "As a psychoanalyst, I'm paid to help you focus on your resentments and help you to find fault with your parents. And secondly, to get you to focus on your 'poor-

me's' and to use up Kleenex as fast as possible." He recalls visiting, as a medical student, the most famous teaching analyst at Harvard and asking him if he knew of any case history in which psychoanalysis had worked. "Yes," the great man said, after a moment's thought. "Why, just recently, a former patient of mine referred her 18-year-old daughter to me."

Vaillant notes that the *Comprehensive Textbook of Psychiatry,* the clinical "bible" of psychiatry and clinical psychology, "has 500,000 lines of text. There are thousands of lines on anxiety and depression, and hundreds of lines on terror, shame, guilt, anger, and fear. But there are only five lines on hope, one line on joy, and not a single line on compassion, forgiveness, or love. Everything I've been taught encouraged me to focus on the painful emotions, 'because people can't do that themselves.' My discipline taught me that positive thinking was simply denial, and that Pangloss and Pollyanna should be taken out and shot. But working with people's strengths instead of their weaknesses made a difference. Psychoanalysis doesn't get anybody sober. AA [Alcoholics Anonymous] gets people sober."



Daniel Gilbert

Effective psychological interventions like AA are in acute demand nowadays. "There is an epidemic of depression in every industrialized nation in the world," declared Seligman at the 2006 positive psychology summit. "It's a paradox; the wealthier we get, the more depressed young people get." Richard Kadison, chief of mental health at the Harvard University Health Services, writing in the *New England Journal of Medicine* in 2005, cited a national survey of 13,500 college students which found that 45 percent reported feeling depression deep enough to prevent them from functioning, and 94 percent felt overwhelmed by everything they had to do. "In our time, depression is on the rise," Ben-Shahar says. "More and more students experience stress, anxiety, unhappiness. Until a few years ago, we didn't have e-mail; now, students check their e-mail 20 times a day. Students work longer hours and are having to build up their résumés to levels that, 20 years ago, were not expected of young people. Students today are looking for ideas that will help them to lead better lives."

Such ideas affect not only psychological states, but economics and culture. "Our world has been run according to neoclassical economics," said Gallup's longtime chairman and CEO, Jim Clifton, at the fall summit. "We squeezed every drop out of that rock—data and equations—and that got maxed out. The world has gotten so much more competitive and now, you need so much more. Edward Deming went to Japan and then the world put Total Quality Management on top of classical economics. Now *that's* maxed out. The next wave will be behavioral economics and cognitive economics—positive psychology, well-being, strengths science. I'm betting my job and this company on it. We are in it for keeps."

Despite abundant evidence arguing for building success on one's personal strengths, about 75 percent of respondents in surveys say that working on one's weaknesses is more important than fostering strengths. This may be because human beings are "very sensitive to danger or pain," says Nancy Etcoff. "Our taste buds respond more strongly to bitter tastes than to sweet ones. That might help us to avoid poison." Etcoff, an evolutionary psychologist, studies how natural selection may have shaped not only our bodies, but our psychological dispositions. Extending the sweet/bitter argument to relationships, she mentions research showing that, unlike couples destined for divorce, spouses in successful marriages have a five-to-one ratio of positive-to-negative gestures when they argue.

"We start with a mild tendency to approach [others]," Etcoff continues. "But when we encounter something negative, we pay extraordinary attention to it. Think about hearing a description of a stranger: 'Joe is happy, confident, and funny. But he's cheap.'" Negative information like this can forecast a problem: if Joe is cheap he may hoard, rather than share his resources with us. "Our emotions are like a smoke detector: it's OK if they sometimes give a false signal," Etcoff says. "You don't die from a false positive. It's better to be too sensitive. We evolved in a world of much more immediate danger—germs, predators, crevasses."

Etcoff's 1999 book, *Survival of the Prettiest,* argued that our attraction to beauty, and beauty itself, were evolutionary outcomes

of natural selection. "One big question was, Are beautiful people happier?" Etcoff says. "Surprisingly, the answer is no! This got me thinking about happiness and what makes people happy." Etcoff, who directs the Center for Aesthetics and Well-Being at MGH, explored "hedonics"—the science of pleasure and happiness—to find out how scholars have measured happiness. (In mood surveys, at any random moment, around 70 percent of people say they are feeling OK, Etcoff says.)

Nobel Prize-winning psychologist and behavioral economist Daniel Kahneman of Princeton (see "The Marketplace of Perceptions," March-April 2006, page 50) asked thousands of subjects to keep diaries of episodes during a day—including feelings, activities, companions, and places—and then identified some correlates of happiness. "Commuting to work was way down there—people are in a terrible mood when they commute," Etcoff says. "Sleep has an enormous effect. If you don't sleep well, you feel bad. TV watching is just OK, and time spent with the kids is actually low on the mood chart." Having intimate relations topped the list of positives, followed by socializing—testimony to how important the "need to belong" is to human satisfaction. Etcoff applied these methods to 54 women, in a study sponsored by the Society of American Florists, and found that an intervention as simple as a gift of flowers that stayed in one's home for a few days could affect a wide variety of emotions—for example, less anxiety and depression at home and enhanced relaxation, energy, and compassion at work.

Environs, too, affect mood. Settings that combine "prospect and refuge," for example, seem to support a sense of well-being. "People like to be on a hill, where they can see a landscape. And they like somewhere to go where they can *not* be seen themselves," Etcoff explains. "That's a place desirable to a predator who wants to avoid becoming prey." Other attractive features include a source of water (streams for beauty and slaking thirst), low-canopy trees (shade, protection), and animals (proof of habitability). "Humans prefer this to deserts or man-made environments," Etcoff says. "Building windowless, nature-less, isolated offices full of cubicles ignores what people actually want. A study of patients hospitalized for gall-bladder surgery compared those whose rooms looked out on a park with those facing a brick wall. The park-view patients used less pain medication, had shorter stays, and complained less to their nurses. We ignore our nature at our own peril."

Etcoff's next book, on happiness and evolution, will attempt to deconstruct happiness itself, distinguishing between concepts like pleasure and desire, or euphoria and craving. "Our reward system is fed by [the neurotransmitter] dopamine that is thought to activate the brain's pleasure centers," Etcoff says. "It is really a brain *desire* system—it's really about wanting. You see all these pleasures, but which ones do you really *want*? People like good-looking faces, but that doesn't mean they desire them. Pleasure and pain are related in the brain, through the opioid neurotransmitters that produce a feeling of comfort. The opioid system triggers pleasure. Sugar, which recalls the sweetness of mother's milk, can set it off. Caressing, sex, fatty foods, sunlight on the skin—all these can do it, too.

"We evolved in a much different world, with much less choice and no sedentary people," Etcoff continues. "We didn't evolve for happiness, we evolved for survival and reproduction." For this reason, we are sensitive to danger. "Pleasure and the positive-reward system is for opportunity and gain," Etcoff explains. "And pleasure involves risk, taking a chance that can override some of your fear at that moment."

Like reaching for joy. "Mammalian evolution has hard-wired the brain for spiritual experience," said George Vaillant at the 2006 summit, "and the most dramatic spiritual experience is joy. Developmentally, the child's smile, the kitten's purr, and the puppy's wagging tail emerge at the same time. These social responses are elicited by, and in turn elicit, positive emotion. They all occur when the infant brain's more primitive limbic system becomes effectively wired to the forebrain."

Negative emotions, like aggression and fear, are as developed in lower animals as in humans. But "the limbic system differentiates mammals from reptiles, and contains most of what we know of positive emotions and spirituality," Vaillant argued. "Negative emotions help us to survive individually; positive emotions help the community to survive. Joy, unlike happiness, is not all about *me*—joy is connection. Beethoven knew little happiness, but he knew joy. The mystics have linked joy to connection with a power greater than themselves."

> "If someone offers you a pill that makes you happy 100 percent of the time, run fast in the opposite direction. Happiness is a place to visit, not a place to live."
>
> —DANIEL GILBERT

Happiness activates the sympathetic nervous system (which stimulates the "flight or fight" response), whereas joy stimulates the parasympathetic nervous system (controlling "rest and digest" functions). "We can laugh from either joy or happiness," Vaillant said. "We weep only from grief or joy." Happiness displaces pain, but joy embraces it: "Without the pain of farewell, there is no joy of reunion," he asserted. "Without the pain of captivity, we don't experience the joy of freedom."

Yet there is far more research on happiness than on joy, the "least-studied emotion," according to Vaillant, whose next book's working title is *Faith, Hope, and Joy: The Neurobiology of Positive Emotion.* "For the last 20 years, emotion has been an unwelcome guest at the table of scholarship," he says. "We treat joy as secret, dirty, and awful, the way the Victorians treated sex. Happiness is largely cognitive; it's a state of mind, not an emotion. That's why social scientists and economists love to study happiness. Happiness is tame."

Don't call Daniel Gilbert a positive psychologist. He isn't one, and doesn't approve of the label, although he doesn't quarrel with the research. "I just don't see what the parade is for," he says. "I don't think psychology needs a movement; movements are almost always counter-productive. By including some people and filling them with irrational exuberance, they divide the field. Positive psychology doesn't cut psychology at the joint. I would-

Ellen Langer

n't condemn the work or ideas; probably 85 percent of the ideas are worthless, but that's true everywhere in science."

That said, Gilbert, a professor of psychology, shares a lot of subject matter with the positive psychologists. His book *Stumbling on Happiness* became a national bestseller last summer. Its central focus is "prospection"—the ability to look into the future and discover what will make us happy. The bad news is that humans aren't very skilled at such predictions; the good news is that we are much better than we realize at adapting to whatever life sends us.

"Is happiness elusive?" Gilbert asks. "Well, of course we don't get as much of it as we want. But we're not *supposed* to be happy all the time. We *want* that, but nature designed us to have emotions for a reason. Emotions are a primitive signaling system. They're how your brain tells you if you're doing things that enhance—or diminish—your survival chances. What good is a compass if it's always stuck on north? It must be able to fluctuate. You're *supposed* to be moving through these emotional states. If someone offers you a pill that makes you happy 100 percent of the time, you should run fast in the other direction. It's *not* good to feel happy in a dark alley at night. Happiness is a noun, so we think it's something we can own. But happiness is a place to visit, not a place to live. It's like the child's idea that if you drive far and fast enough you can get to the horizon—no, the horizon's not a place you get to."

Gilbert reconsiders his grandmother's advice on how to live happily ever after: "Find a nice girl, have children, settle down." Research shows, he says, that the first idea works: married people are happier, healthier, live longer, are richer per capita, and have more sex than single people. But having children "has only a small effect on happiness, and it is a negative one," he explains. "People report being least happy when their children are toddlers and adolescents, the ages when kids require the most from the parents." As far as settling down to make a living—well, if money moves you into the middle class, buying food, warmth, and dental treatment—yes, it makes you happier. "The difference between an annual income of $5,000 and one of $50,000 is dramatic," Gilbert says. "But going from $50,000 to $50 million will not dramatically affect happiness. It's like eating pancakes: the first one is delicious, the second one is good, the third OK. By the fifth pancake, you're at a point where an infinite number more pancakes will not satisfy you to any greater degree. But no one stops earning money or striving for more money after they reach $50,000."

The reason is that humans hold fast to a number of wrong ideas about what will make them happy. Ironically, these misconceptions may be evolutionary necessities. "Imagine a species that figured out that children don't make you happy," says Gilbert. "We have a word for that species: *extinct.* There is a conspiracy between genes and culture to keep us in the dark about the real sources of happiness. If a society realized that money would not make people happy, its economy would grind to a halt."

When we try to project ourselves into the future, we make a systematic series of errors, and much of *Stumbling on Happiness* analyzes them. One common miscalculation is "presentism," the belief that we will feel in the future the way we feel today. "In a grocery store, feeling hungry, I try to shop for what I will want to eat next Wednesday," Gilbert says. "Then Wednesday comes, and I ask myself, 'Why did I buy jalapeño pockets?'"

Secondly, humans are marvelous rationalizers. "Find a large number of people who've been left standing at the altar and ask them if that was the worst day, or the best day, of their lives," Gilbert says. "On the day it happens, almost without exception, they will say it is the worst day. But ask these same people the same question a year later and most will say it was the *best* day of their lives. People are much more resilient than they realize. In the lab, it's very easy to get people to rationalize, but almost impossible to get them to foresee it. Rationalization is an invisible shield that protects us from psychological pain, but we don't realize that we are carrying it.

"Much recent data show that people fare reasonably well in a variety of tragic and traumatic circumstances—Christopher Reeve was not unusual," Gilbert continues. "Paraplegics are generally quite happy people. And blind people often say that the worst problem they have is that every- *(please turn to page 94)*

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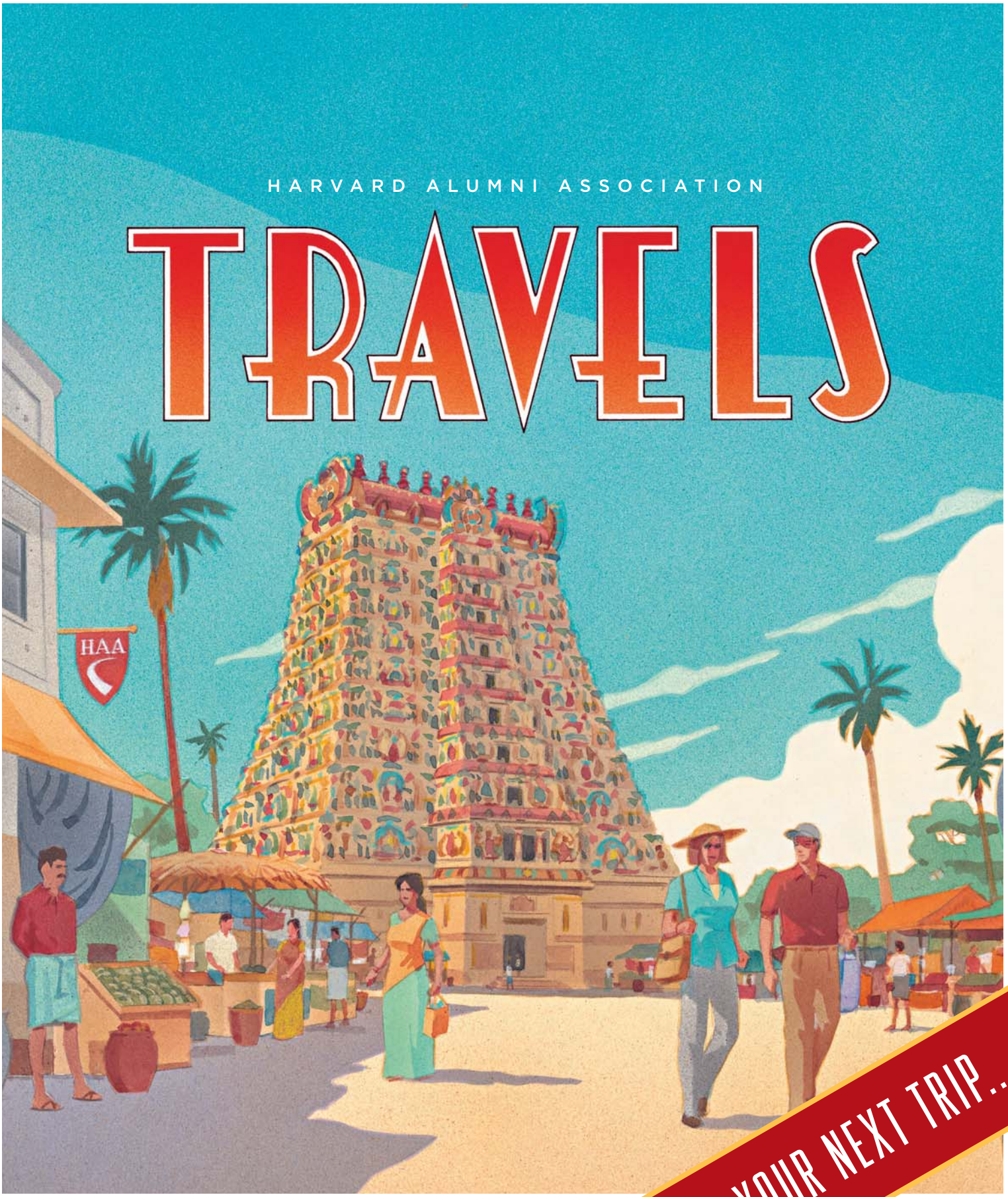

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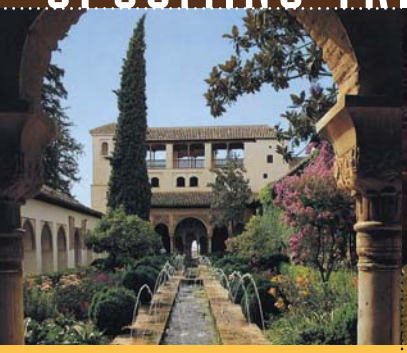

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Alexander Wheelock Thayer

Brief life of Beethoven's biographer: 1817-1897

by HENRY N. CLAMAN *and* LUIGI D. BELLOFATTO

As a pianist, conductor, and composer, Ludwig van Beethoven was the most famous musician in music-crazy early-nineteenth-century Europe. He also displayed personal traits—a love of nature, a mercurial temperament, unorthodox behavior—that made him a superb embodiment of the wild "Romantic genius." It is thus surprising that it took so long after his death in 1827 for a qualified biographer to appear. The early contenders—Franz G. Wegeler and Ferdinand Ries in 1838, Anton Schindler in 1840—were friends of Beethoven whose accounts were interesting but skimpy, unscholarly, and contradictory.

Enter Alexander Wheelock Thayer, A.B. 1843, LL.B. '48, a proper Bostonian with research skills gained as a Harvard library assistant. He was very musical, although he played no instrument: he had composed some short works, read extensively in music history and criticism, and had written short magazine pieces on those subjects. He knew of the existing lives of Beethoven, and their flaws, and conceived of writing his own scholarly biography. In 1849 he left for Europe "to study the German language" (as he wrote 40 years later) "not so much for its noble literature, as in the hope of finding new matter to add to Schindler, Wegeler, and Ries's writings upon Beethoven, the whole to be digested into a modest and concise volume of biography for American readers."

For two and a half years he traveled, doing research while supporting himself by writing articles on European culture for the *Boston Courier*. Despite frequent ill health (possibly migraines), which continued throughout his life, he returned home only when his money ran out. He joined the *New York Tribune* ("I overworked my brain on that newspaper and have never recovered," he recalled), but in 1854 was back in Germany, pursuing his former routine.

By the mid 1850s he had decided to write the biography in English, but also to have it translated into German, the language of Beethoven and of nineteenth-century scholarship. He was assiduous in gathering primary sources, scouring old newspapers for contemporary references and even obtaining court records of the composer's legal battles to obtain custody of his nephew, Karl. He analyzed Beethoven's Conversation Books, containing written questions and answers to and from the deaf composer, and was proud to be "the first person ever to use Beethoven's sketch books for chronology." He also tried to interview those who had known Beethoven decades before. He wanted to be as objective as possible—he described Beethoven's inner turmoil, his problems with women, and his often-troubled relations with publishers—and to collect material that might otherwise be lost and that could be useful to later scholars. "I fight for no theories, and cherish no prejudices," he asserted proudly. "[M]y sole point of view is the truth."

In 1858, his article "Beethoven: his childhood and youth" was published anonymously in the *Atlantic Monthly*—the first work of its kind based on original documents.

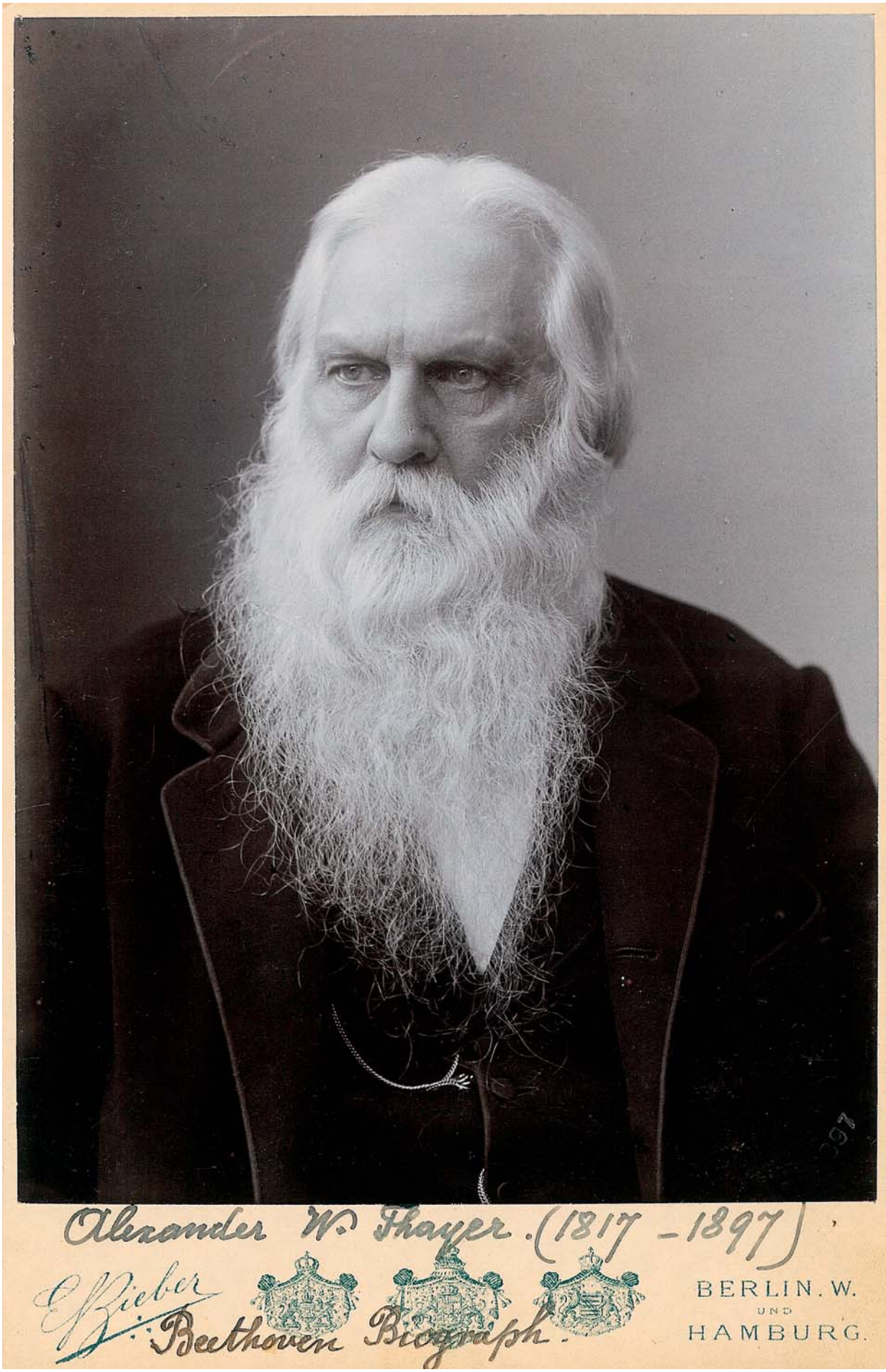
Thayer was not only a formidable historian, he was a versatile prose stylist. His *Beethoven* is a model of sobriety, but he could be a severe and sometimes sarcastic critic. His lengthy 1860 *Atlantic Monthly* review of A.B. Marx's Beethoven biography skewered the author for inaccuracies, superficialities, and unacknowledged borrowings. By contrast, his articles on Antonio Salieri in *Dwight's Journal of Music*, perhaps the most thorough biography of that composer and teacher yet to appear in English, are often quite breezy.

In 1862, aided by Senator Charles Sumner, a fellow alumnus, Thayer began a diplomatic career, joining the American legation in Vienna while continuing work on his magnum opus. In 1865 he became U.S. consul in Trieste, where he served until 1882 and spent the rest of his life, filling his home with Beethoven memorabilia and participating enthusiastically in the musical and social activities of his adopted city. He executed his consular duties and wrote various books and essays even as his health deteriorated, but his intense commitment to the biography is indicated by a comment to his American editor, Henry E. Krehbiel, that an hour or two of thought devoted to Beethoven unfitted him for labor of any kind.

The writing, translating, and publishing of his great work proved a long, complex venture. Thayer entrusted the German translation to his friend Hermann Deiters, a musicologist; the first three volumes, covering Beethoven's life to 1816, were published in 1866, 1872, and 1879 in Berlin. It is not fully clear where in the biography Thayer himself stopped writing, forcing subsequent editors to work from his notes. After Deiters died in 1907, before completing volume iv (through 1823), fellow musicologist Hugo Riemann finished it and the fifth and final volume. They appeared in 1907-8.

Not until 1921—almost 75 years after Thayer first traveled to Europe—did an English *Life of Beethoven* appear, compiled by Krehbiel from its author's original manuscript, his notes, and the German edition. It was worth waiting for. In spite of all the delays and revisions, the book is still that of Alexander Wheelock Thayer. His patient research through "the long and wearisome labors of so many years," as he put it, brings us closest "to Beethoven the *man*."

Henry N. Claman '52 is Distinguished Professor of medicine at the University of Colorado, Denver, as well as a pianist and trained choral singer. Italian engineer and musicologist Luigi D. Bellofatto, a trained pianist and organist, is at work on the first full-length biography of Thayer. The Life of Beethoven *was most recently revised and edited by the late Peabody professor of music emeritus, Elliot Forbes '41, D.Mus. '03, to whose memory the authors dedicate this article.*



A rare photograph of Alexander Wheelock Thayer, dated 1897, the year of his death, from the collection of Luigi D. Bellofatto. Reprinted with permission.

KEN'S STORY

One patient's role in the cancer treatment revolution

by DAVID G. NATHAN

A "rapidly developing revolution in cancer treatment" has prompted David G. Nathan, M.D., president emeritus of Dana-Farber Cancer Institute, to detail three patients' experiences in a forthcoming book, to help nonscientific readers understand the promise and pitfalls of this new research. In doing so, he also aims to clarify "three well-established principles of medical research":

- *that the determination, positive outlook, and persistence of patients, their families, and their physicians strongly influence medical progress;*
- *that most novel treatments are derived from an amalgam of basic research and clinical observations that may stretch over decades before a successful application can be made in patients; and*
- *that the first effective treatments for a heretofore incurable disease are usually incomplete—they form the basis of the next steps.*

One of the patients, Ken Garabadian, was afflicted by a gastrointestinal stromal tumor (GIST) that posed severe treatment challenges, and his struggle highlights a fundamental thread in this medical revolution. Nathan explains "the establishment of precise, DNA-based understanding of how a cancer grows; the description of the mutant proteins derived from abnormal cancer DNA; and the recent discovery of new 'smart' drugs such as Gleevec that interact chemically in very specific ways with those proteins and arrest tumor growth. Smart drugs were critical as Ken dealt with GIST—and the same tools will be essential for managing more common cancers, particularly those resistant to classic chemotherapy treatments."

"Ken's Story"—the patient narrative and the accompanying history of biomedical research—are adapted here from chapters 16 through 18 of Nathan's forthcoming book, The Cancer Treatment Revolution, *to be published by John Wiley & Sons, Inc.* —*The Editors*

THE PATIENT

KEN GARABADIAN WAS BUILT LIKE A FIREPLUG. I had a few inches on him, but his compact physique and firm handshake left the sound impression that I would fare poorly in a physical contest against this former wrestler. I met him because he had a type of cancer that was absolutely untreatable until just a few years ago: a highly aggressive and widespread sarcoma, a type of cancer that can afflict muscles, nerves, brain, and bone, as well as fat, cartilage, and fibrous tissue and in his case involved his gastrointestinal tract.

Ken was overweight, but never had health problems until a single cell mutated and brought on his cancer. He moved quickly and gracefully and his bright eyes darted around to take in new surroundings. He regularly walked five miles a day, had normal blood pressure and cholesterol, and felt well. His life at home and work was also fine. His marriage with Peggy, who had been his sweetheart since they were 11 years old, was ideal. They had an adult son and a daughter, and a grandchild. The couple also enjoyed their jobs. Ken, a salesman, called his work "wonderful" and his fellow employees at a Massachusetts manufacturing company "great to me." With two secure incomes on hand, a nearly paid-off mortgage, and good health insurance, the couple were financially secure and very happy.

In 1998, when he was 49, Ken began to notice some weakness and mild shortness of breath when he walked briskly or climbed

Excerpted with permission of the publisher, John Wiley & Sons, Inc., from *The Cancer Treatment Revolution: How Smart Drugs and Other New Therapies Are Renewing Our Hope and Changing the Face of Medicine*, by David G. Nathan. Copyright © 2007 by David G. Nathan.

stairs. The symptoms were slowly but inexorably progressive. He reported them to his primary physician, who tested his blood and found him seriously anemic. He also tired quite easily. The primary physician referred Ken to a blood specialist, who noted that his red blood cells looked as though he had become iron deficient.

But the case was puzzling. Iron deficiency does not occur out of the blue: bleeding is the only way to eliminate iron from the body. The only bodily site for significant but invisible bleeding by men is the gastrointestinal tract. A doctor who sees a man with iron deficiency of unknown cause must become what I call a "stool pigeon"—he or she has to hunt for blood in the stools until it is found. Next, the physician must locate the bleeding point somewhere in the 25 feet of intestines.

The specialist was well-trained and repeatedly tested Ken's stools for blood, but could not find any trace of it. Then he made a mistake. Instead of concluding that his diagnosis must be flawed, he decided to treat Ken with iron, believing that the blood loss must be subtle and that his tests had simply missed it.

In fact, Ken turned out to fall in the group of one out of every 10 patients who seems to have an iron deficiency yet is not bleeding. When people have chronic inflammation from an abscess, rheumatoid arthritis, colitis, or a large tumor, the liver overproduces a small signaling protein that commands the storage cells that normally release iron into the blood to hold tightly to the metal. The resulting lack of iron in the blood starves newly formed blood cells and patients become anemic. Ken had no obvious abscess on his body, was free of rheumatoid arthritis or colitis, and showed no external signs of having a tumor, so the hematologist did not sufficiently worry about those possibilities.

The dramatic effect of Gleevec on Ken Garabadian's cancer led the manufacturer, Novartis, to feature this photograph of him in an ad.

Most good medical care is built on a solid basis of paranoia. Doctors must always suspect that someone or something is out to get their patients. The best physicians try to cover up their excessive worry to spare the patient impossible anxiety, but they always live suspiciously, trusting no one, especially themselves and their diagnoses and even mistrusting the patient, who may not be following necessary instructions. The art of medicine lies in invisible suspicion and silent self-criticism. Ken did not know it yet, but he desperately needed just this sort of doctor on his team.

If the hematologist had been more critical of his own reasoning and had used modern imaging techniques such as computerized tomography (CT) to make a clear picture of the organs in his patient's abdomen, he might have correctly diagnosed the situation and prevented what would become a disaster. Unbeknownst to Ken or his doctors, a mass of rapidly dividing cancer cells was emerging from his small intestine in the form of a growing tumor. The cancer cells were releasing proteins that interrupt many normal body systems. One or more of those proteins had entered the liver and instructed it to release a large amount of the signaling protein that blocks iron from returning to the blood from storage cells. Ken thus developed all the signs of anemia even though he had plenty of iron in his body.

When iron pills did nothing and Ken grew weaker, he received repeated red blood cell transfusions. That alarmed his primary physician, who insisted on further inquiry. Ken had a colonoscopy, but it, too, was utterly unrevealing. The primary physician was not quite suspicious enough. Like the specialist, he did not order a CT scan of Ken's abdomen.

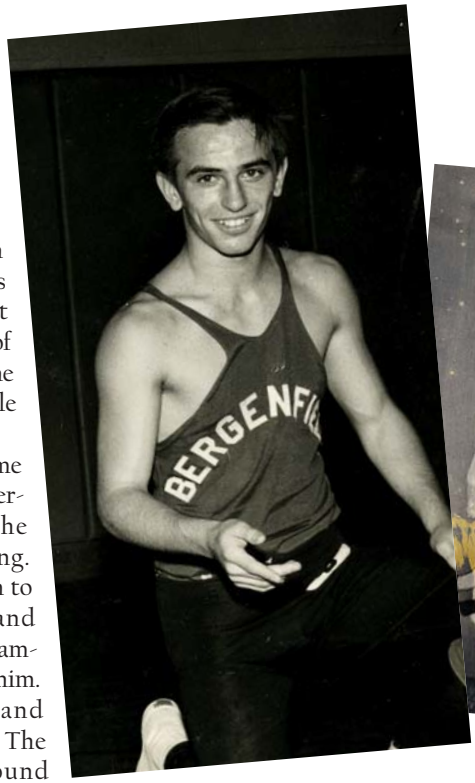
Two years later, Ken talked to me about his reaction to the mistaken diagnosis. "I think we have a responsibility to ourselves in every way, but [in the past] I forfeited that when it came to medical matters. In every other area of my life—financially, intellectually, spiritually and emotionally—I always took care of myself and took responsibility for myself. When it came to the [possibility of the] physical end of my life, I abdicated. I simply said, 'These people have degrees; I'm going to trust them.'"

Ken continued the blood transfusion and iron regimen without incident until July 1999. Peggy was out of town the night disaster struck. Afterwards, Ken hazily recalled awakening with a start in the middle of the night because he felt what he described as "a pop in my abdomen." Suddenly his stomach muscles contracted violently and became rigid. He tried to roll into a ball to relieve the terrible pain, but it began to consume him. He shrieked in pain and terror and broke out into an enormous sweat that

Photograph courtesy of Novartis Pharmaceuticals

soaked the sheets in seconds. Then he started to lose consciousness as his blood pressure began to collapse. He was going into shock, but he had the presence of mind to grab the phone from the bedside table and call 911.

He groaned his name and address to the operator and told her he thought he was dying. The operator told him to stay on the phone and talk to her until the ambulance could get to him. She kept talking and making him answer. The police and EMTs found him moments later babbling incoherently, rolled up in the soaked sheets, sweat still pouring from his body. His bowels had opened and he was smeared with feces. They could feel a pulse at the neck, but his blood pressure was almost unobtainable. His belly was as hard as a board. They knew immediately that Ken was dying of an abdominal catastrophe and rushed him to the emergency ward of the local community hospital.



Ken as a varsity wrestler at Bergenfield (N.J.) High School, 1966; Ken and Peggy O'Connell at their graduation party in 1967

The surgeon who took care of Ken that night had about two minutes to make a decision. One look convinced him that Ken was suffering from peritonitis, a profound inflammation of the abdominal cavity probably due to rupture of the intestine or appendix. No time was available for imaging assays like routine X-rays or CT scans. The doctor had to rely on the history and his physical examination, experience, and skills.

As soon as Ken's belly was opened the surgeon realized that his overall diagnosis was correct. The cavity was filled with gas and greenish foul-smelling fluid that could only come from the contents of the bowel. The surgeon learned exactly what was happening when he sucked out buckets of the mess. A grapefruit-sized tumor was growing out of the small bowel. The cells in the center of the tumor had died from lack of blood and the bowel wall

THE RELEVANT BIOMEDICAL RESEARCH

The story of "smart drugs" and their role in the present cancer-treatment revolution has its roots in the nineteenth century, when a strange cancer epidemic repeatedly swept through U.S. poultry farms where hens were packed tightly together. Typically the affected birds developed swollen bellies and gasped for breath. Their abdomens, when cut open, were full of masses of cells—cancer. Less commonly, the birds grew large tumors on their wings. Poultry farmers were desperate: when one bird developed a tumor, the entire flock succumbed.

The mystery intrigued Peyton Rous, a physician who had accepted a full-time appointment in 1910 to direct cancer research at the newly created Rockefeller Institute of Medical Research in New York (now Rockefeller University). Rous, who had been brought up on a Texas cattle ranch, started his work after a poultry farmer brought a chicken with a wing sarcoma to his new Rockefeller lab. The researchers minced up the cancer and suspended the chopped cells in water. The mixture did not include any intact cells, yet after Rous injected the material into the wings of normal chickens, they developed sarcomas. This meant the cells had to be associated with a tumor-causing agent.

Rous next fractionated the mixture of minced tumor cells by filtering it through progressively narrow filters until the material showed nothing visible, even under a microscope. But chickens injected with the seemingly empty fluid promptly developed tumors. In 1910 Rous concluded that a virus—a particle so small it could pass through any filters he had—must cause the tumors.

That he reached this conclusion was remarkable, because the causes of cancer were virtually unknown at the time. The most relevant previous work was that of Theodor Boveri, a German biologist who had demonstrated that most cancer cells have abnormal chromosomes, the elements of heredity. Boveri's findings had suggested that cancer is due to mutations of genes.

The report of Rous's experiment landed on the medical science community with a dull thud. And when Rous tried the same experiment with mouse and rat cancers, he never saw the same result. Although his work was eventually vindicated—he shared the Nobel Prize in medicine in 1966—the mechanism by which the Rous virus actually causes cancer remained unknown for many more years. Understanding that mechanism was critical to finding a way to kill off the sarcoma that might be related to it.

That effort started in the late 1940s and early 1950s, when Renatto Dulbecco and Salvador Luria, two expatriate Italian physicians who later received Nobel Prizes, initiated basic research and training programs in molecular biology at Indiana University and later at the California Institute of Technology and the Massachusetts Institute of Technology, respectively. The scientists they trained and, in turn, the students of those trainees, played key roles not only in the biology of RSV, but also in mak-

Family photographs above and on page 41 courtesy of Peggy Garabadian

Undergoing a PET scan: the photograph of Ken that accompanied a *New York Times* article on new anticancer drugs

ing major basic discoveries about proteins, genes, DNA, and the related structure RNA in the second half of the twentieth century. Because of that work, we know that our 20,000 to 25,000 genes are large molecules, known as polymers, that are made of DNA and lie along stretches of chromosomes in the nucleus of cells. DNA produces somewhat similar polymers known as RNA, which, in turn, engage the protein-making machinery in the cells. In that fashion, each gene produces an RNA copy, and the RNA links together amino acids, the building blocks of proteins, to produce the completed protein that the gene governs. A mutation in DNA thereby causes a mutation in its RNA and, hence, disturbance of the protein's structure—its sequence of amino acids. The change in structure can alter the function of the protein and result in disease.

In the mid 1960s Howard Temin, who had been trained by Dulbecco, argued that when an RNA tumor virus enters a host cell's nucleus, a viral enzyme transforms its RNA into DNA that is then incorporated into the DNA of the host cell's chromosomes. The action forms new host genes that in turn produce more viral RNAs, and thereby more viral particles that leave the cell and go on to infect other cells.

Temin's idea seemed preposterous: the central dogma of molecular biology had been that DNA makes RNA, which makes protein. Nobody of consequence thought RNA could produce DNA. But in the early 1970s, Temin and David Baltimore, who had also worked with Dulbecco before joining Luria's department at MIT, separately and simultaneously discovered reverse transcriptase, the viral enzyme that converts RNA to DNA. The discovery exploded the dogma, explained the life cycle of RNA tumor viruses, earned Temin and Baltimore a Nobel Prize in 1975, and led Michael Bishop and Harold Varmus to solve the mechanism by which the Rous virus causes cancer (for which *they* won a Nobel Prize in 1989).

Bishop and Varmus, two physician-scientists at the University of California, San Francisco, had met in California in 1970 shortly after Bishop had established a laboratory at UCSF to study tumor viruses. They showed that at some time in the distant past a benign strain of the Rous virus had invaded and incorporated its three RNA genes into the DNA of the cells of a host chicken. To do so, the virus had to copy its RNA into DNA with the reverse transcriptase enzyme and insert that DNA into the chicken cell chromosomes.

Errors can happen when reverse transcriptase does its work because many steps are involved. At least once, the reverse tran-

Photograph courtesy of Jodi Hilton

Peggy Garabadian at home in November 2006; Ken said of his wife, "She has been a tiger through this."

After cleaning out the cavity, the surgeon began the delicate process of removing the tumor and the 18 inches of small intestine to which it was attached. He sewed the severed ends of the intestine together to maintain its continuity. He repeatedly washed and sucked out any remaining loose contents of the cavity, trying to remove some of the bacteria and cancer cells. He counted on a high level of intravenous antibiotics to finish off the bacteria, but he feared that one or more—perhaps many more—of the loose cancer cells would find a hospitable niche somewhere in the abdomen, and begin to replicate.

Despite the excellence of that surgical care, Ken barely survived. Scar tissue from the initial operation caused problems that required further surgery. Stretching of the small intestine caused under those cells had virtually liquefied, leaving a large hole through which the bacterial-laden bowel contents were pouring into the abdomen. Along with bacteria, the cancer cells that had formed the tumor had been spreading throughout the belly.

scriptase "forgot" its role and began to copy an RNA derived from a gene that belonged to the chicken. It then copied the chicken RNA incorrectly and inserted that incorrect copy into the host chicken cell's DNA. That left the cell with a DNA blueprint to fabricate a virus with four instead of three genes. The fourth, abnormal gene produced a mutated chicken protein that causes cells to proliferate wildly, resulting in cancer. Bishop and Varmus called the new cancer-causing gene "src" (pronounced *sarc*), because it was found in the mutant Rous sarcoma virus.

Bishop and Varmus coined the term "oncogene" (meaning a tumor-causing gene) to describe the mutant src gene and others in this new class. And they firmly established that the src oncogene arises from a perfectly normal cellular src gene they called a "proto-oncogene." The idea was that certain normal genes in cells could be changed or mutated to become lethal oncogenes that produce oncoproteins, and the resulting cancers could become dependent on the oncoprotein product of oncogenes for their survival.

The Rous virus now had a basic molecular explanation, and a huge step had been taken in cancer genetics. If the protein product of a single gene could cause and maintain cancer, finding a drug that would inhibit that protein's function and cure the cancer should be possible.

By the early 1980s, several laboratories had demonstrated that the src proto-oncogene encodes a normal enzyme, a member of a large class of protein kinases called tyrosine kinases. Such enzymes transfer signals through a chain of proteins that ends within the cell nucleus. They perform their signaling function by transferring molecules of high-energy phosphorus (derived from ATP, the energy storage molecule of the cell) to tyrosine, one of their constituent amino acids, or to tyrosines in similar enzymes. Thus tyrosine kinases contribute to a network of hundreds of signaling proteins that work together to regulate cell division, normal cell death, and the functional destiny of cells. But if an oncogenic mutation of the src proto-oncogene disrupts the amino-acid sequence of the src tyrosine kinase protein, the protein—now an oncoprotein—can become hyperactive. By passing too many signals through the kinase chain to the cell's nucleus, the abnormal oncoprotein causes rapid-fire cell division, diversion from the death pathway, and, hence, cancer.

Many oncogenes (such as oncogenic tyrosine kinases) have now been detected worldwide. Two of these, abl and kit, play key roles in "Ken's Story."

The kit oncogene was first discovered in kittens burdened by an RNA tumor virus that causes feline leukemia. Other research showed that the normal kit proto-oncogene exists in *all* mammalian cells, including those of humans.

Normal kit protein, the product of the kit proto-oncogene, turned out to be a tyrosine kinase with one important difference from the src or abl proteins. The kit enzyme is a receptor tyrosine kinase. The protein pushes its head through the cell membrane and waves it in the fluid surrounding the cell. The rest of the protein, including its signaling tyrosine, lies in the body of the cell, waiting to pass signals when an external protein latches on to and combines tightly with the waving head.

This kind of receptor tyrosine kinase is particularly useful during the maturation of a fetus. Proteins in fluids around fetal

Photograph by Stu Rosner

a reversal of the normal waves of contraction when he ate, leaving him nauseous and vomiting after meals. His digestive system needed several months to adjust to its reconstruction. Even more dangerous, inflammation and multiple surgeries often cause a large increase of clotting proteins in the blood, and Ken developed clots in his leg veins. Some broke off as embolisms and traveled into his lungs, obstructing blood flow, which could have caused a heart attack. He required prolonged intravenous and oral drugs known as anticoagulants to clear his legs and lungs of the clots—and because such drugs induce a risk of gastrointestinal bleeding, he needed regular blood tests to ensure that his clotting system was reduced but not abolished. Weeks of anticoagulants and blood tests nearly destroyed the veins in his arms.

The newlyweds on July 25, 1970, and on a thirty-fifth anniversary cruise four months before Ken's death

As Ken was fighting off blood clots, his doctors and then Peggy learned about the nature of his cancer. They thought the tumor looked like the kind that arises in supporting tissues such as muscle, tendon, and bone, called sarcomas. (The Greek words *sarkos* and *oma* mean "flesh" and "swelling," respectively.) They waited for a few days before they told him what was going on, because no effective treatment for a gastrointestinal stromal tumor was known, apart from complete removal by surgery—an opportunity lost when the tumor ruptured.

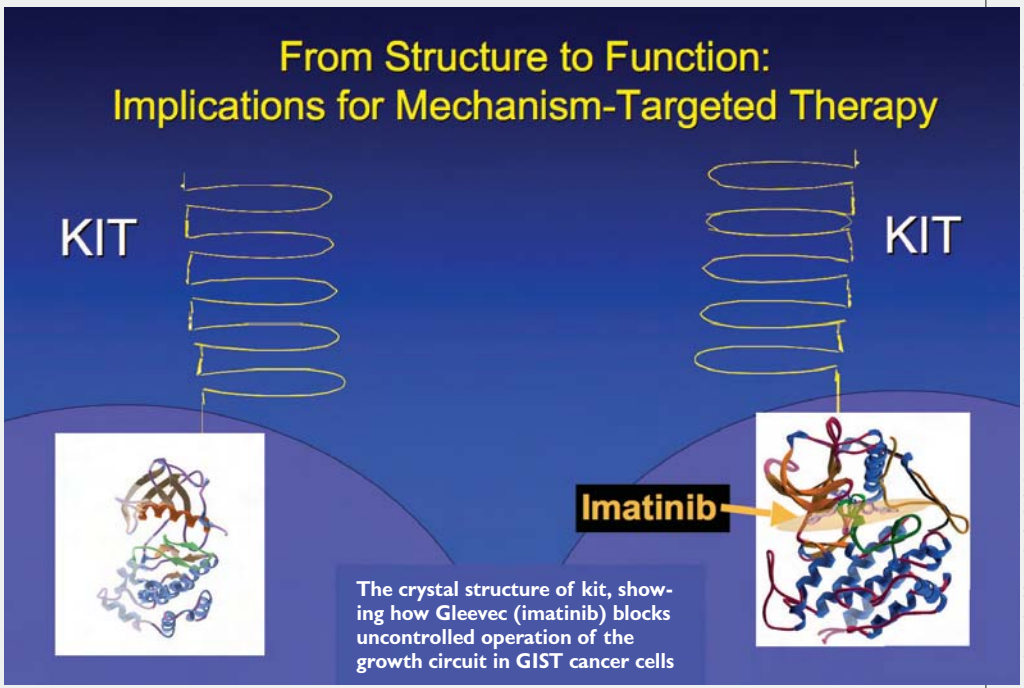
Meanwhile, Ken had begun to gain weight again, after having lost 40 pounds. His body again started to make red cells filled with hemoglobin. With good care from his doctors and Peggy's ceaseless monitoring, he slowly regained strength. His short walks lengthened from around his room to trips down the hospital corridors.

When, after a few weeks, the surgeon concluded that Ken was

cells that bind to such receptor tyrosine kinases can cause selected populations of fetal cells to divide and differentiate, to become organs or parts of organs. Researchers have found that mice lacking essential receptor tyrosine kinases like kit or one of the specific proteins that bind to such receptors have different congenital abnormalities ranging from anemia and hair color loss to defective organs.

The understanding of kit's usual role in the body started in the late nineteenth century, when the Spanish neuroanatomist Santiago Ramon y Cajal explored the neural cells of the gastrointestinal tract. Cajal, who won a Nobel Prize in 1906, wanted to know how the bowel muscle receives instructions to contract in the synchronized manner called peristalsis. The answer involved recognizing that a layer of bowel tissue contains a complex network of nerve-like cells, now named for Cajal. These large cells have multiple short extensions that protrude from their outer walls and wrap around those of neighboring Cajal cells, forming an ideal structure for passing along signals. Nevertheless, proof that these cells actually control peristalsis did not emerge until 1995, when Alan Bernstein reported that mice born without a functioning kit gene are chronically constipated and very deficient in Cajal cells—and the few they do have lack the kit protein.

Three years later, pathologists working in Sweden applied Bernstein's mouse studies to human cancer. Gastrointestinal stromal tumors (GISTs) and others like them originally had vague de-



The crystal structure of kit, showing how Gleevec (imatinib) blocks uncontrolled operation of the growth circuit in GIST cancer cells

ILLUSTRATION COURTESY OF GEORGE DEMETRI; CRYSTAL STRUCTURE COURTESY OF C. MOL, ET AL, J. BIOL CHEM 2004

healthy enough to take the bad news, his doctors told him he had an incurable cancer. Ken took it stoically. He was one tough patient, just as he had been a wrestler.

But Peggy was not willing to accept that nothing more could be done. She had begun to explore the Internet for information about the disease, and had learned that no combination of standard anticancer drugs had proven effective in treating GIST. She also found an Internet article about the treatment of sarcomas by Dr. George Demetri at Dana-Farber Cancer Institute in Boston. She called Demetri and made an appointment for her husband. That decision would be a turning point for Ken.

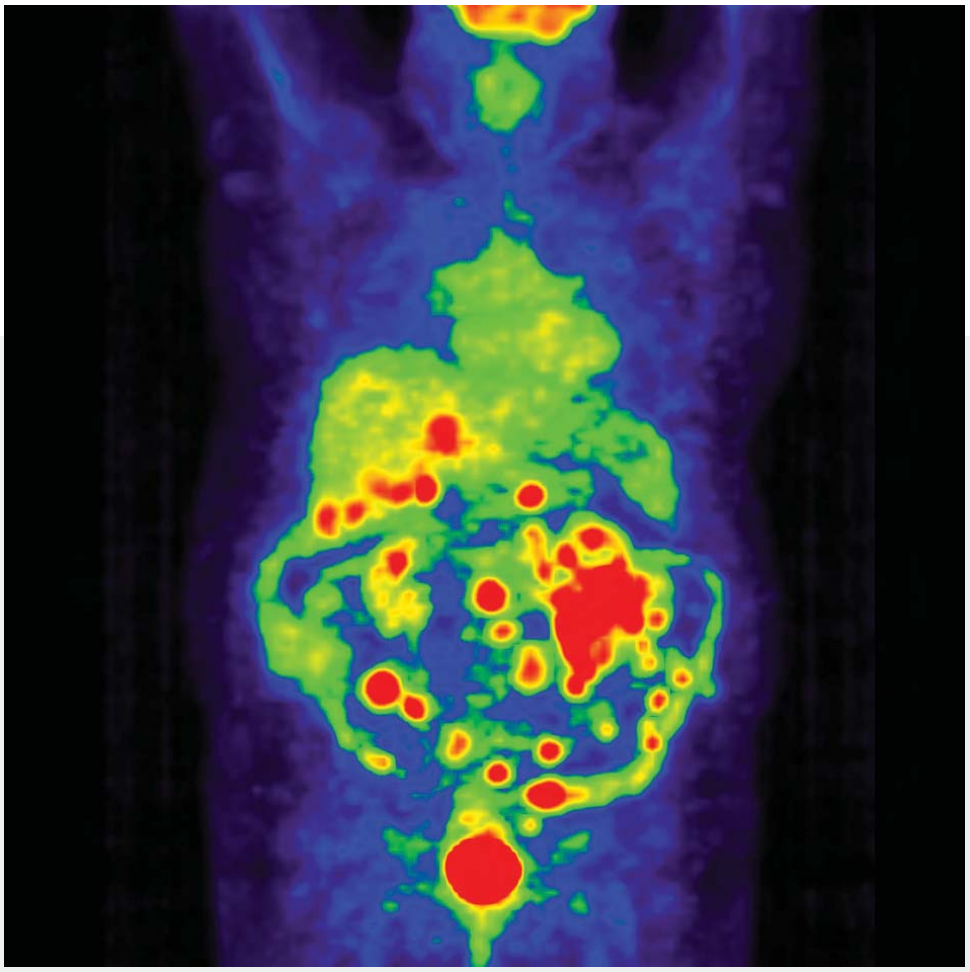
By the time Ken was strong enough to see Demetri, he and Peggy were already more knowledgeable about gastrointestinal stromal tumors than most physicians are, and they wanted to learn much more. Ken rapidly became fascinated by the energy and expertise that Demetri and his team were pouring into sarcoma research.

For the moment, Ken did not need treatment; he had no detectable disease. But sooner or later, his abdomen would become full of GIST tumors that would kill him if they were not stopped in their tracks.

Demetri acknowledged that, while offering some realistic hope. "You're here at the perfect point in history," he said. "There's a tremendous amount of work going on in this field right now. You've got a cancer that we know a lot about genetically and we're going to know more about it as we go down the road together." The doctor's team was about to conduct tests on a drug that might combat GIST: Gleevec, a new "smart" drug that had just been tested successfully against an unusual leukemia, chronic myelogenous leukemia (CML).

In June 2000, a positron emission tomography (PET) scan, which measures the uptake of radioactive sugar by cells to assess whether they are living or dead, showed that Ken had at least 40 small but growing GIST tumors and four larger ones, each caused by a cell spewed out of the original tumor. He needed treatment, but Gleevec had not yet been cleared for use in GIST. "George tried me on an experimental drug called ET-743," Ken noted. "It had no effect on me. He just kept smiling and saying, 'Don't worry, we've got this thing coming along called STI-571 [Gleevec]. The mice seem to love it.'

"So we were patient, and fortunately nothing was pressing a major organ. He started me on the Gleevec in July 2000. It was al-



July 2000: PET scan reveals active metastatic GIST throughout Ken's abdomen and liver. (The brain and bladder activity are normal.)

scriptive names because no one actually knew their cell of origin. The Swedish pathologists, suspecting Cajal cell origin, used a special stain for kit protein and found that the tumor cells stained heavily. They concluded that GISTs must arise from a cancerous Cajal cell.

One more step was necessary. A year after Ken Garabadian's diagnosis, both Yukihiko Kitamura, a pathologist then at the Osaka University School of Medicine in Japan, and a team that included Marcia Lux, a Harvard medical student, and Jonathan Fletcher, a pathologist at the Brigham and Women's Hospital in Boston, reported that malignant Cajal cells in GISTs are loaded with excessive kit activity, and at least one of the two kit genes in the tumor is mutated.

Although the *amount* of kit protein in GIST cells is normal, its *activity* is enormous. GIST most often comes about when one of the millions of Cajal cells in the bowel suffers a mutation in one kit gene so that it produces an oncoprotein that stays active continuously, passing signals to the cell's nucleus telling it to divide. Overwhelmed, the nucleus divides and replicates rapidly, as do its daughter cells and those of future generations. The signals also enhance the cells' survival by instructing them to avoid the death pathway. A large tumor forms. That is just what happened to Ken. Then it was up to doctors like Dana-Farber Cancer Institute's George Demetri to find a treatment to kill such tumors in their patients, if they could.

The trail of discovery of one "killer" smart drug for patients with GIST began in 1960. At the University of Pennsylvania, geneticists Peter Nowell and David Hungerford adopted a new

PET scans here and on page 44 courtesy of Drs. Annick Van den Abbeele, Leonid Syrkin, and George Demetri

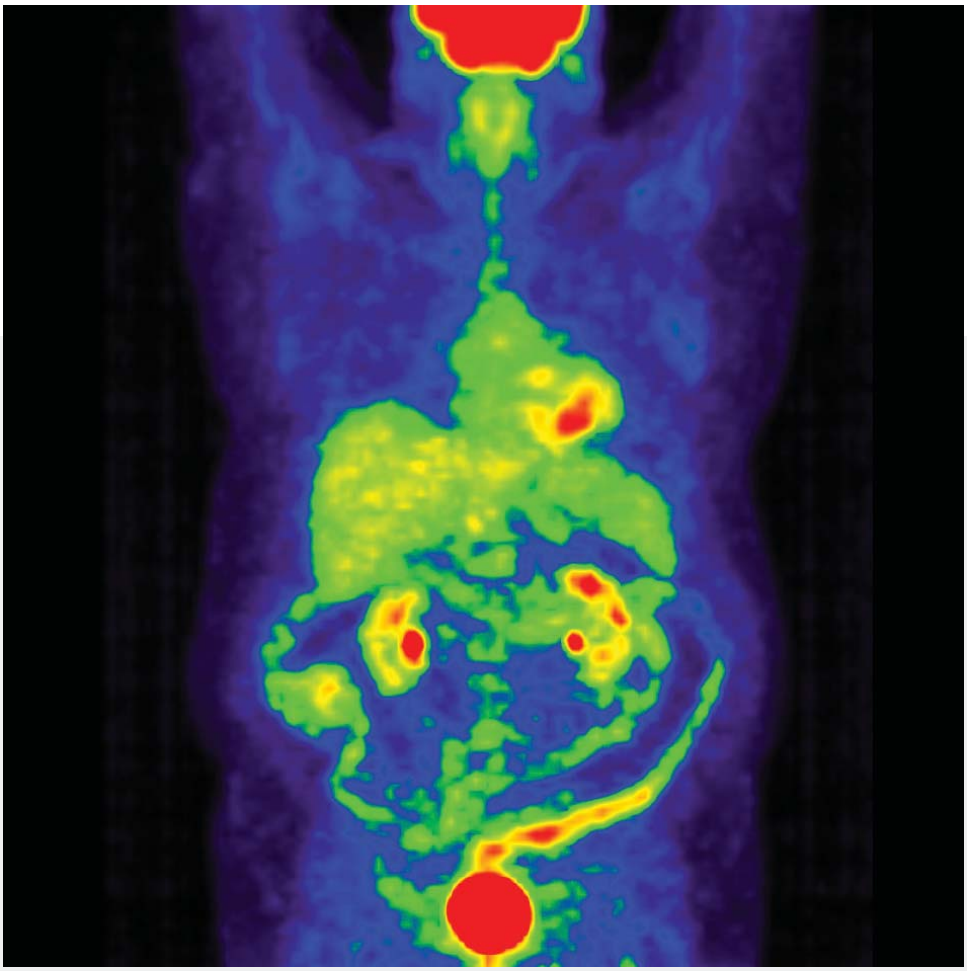
But Ken was certain he would encounter more difficulty. He knew that the emergence of resistance is virtually the rule in single-agent chemotherapy—and he was right.

most exactly a year to the day that the tumor had burst into my belly. Within two weeks, all the tumors in my belly were 'cold' [the PET scan showed no uptake of sugar]—which I never expected. I expected 5 or 10 percent. When he came inside and said, 'Your whole scan is cold,' I think it was just one of the happiest days of my life." Some weeks later a CT scan of Ken's belly found that the tumors were shrinking. Ken became a poster boy for Gleevec and the treatment of GIST for two years. He spoke on the radio as a cancer survivor, appeared on a cancer special that played on cable TV, and was featured in a long *New York Times* article on new anticancer drugs.

But he was certain he would encounter more difficulty. He knew that the emergence of resistance is virtually the rule in single-agent chemotherapy—and he was right. In July 2002, a routine PET scan showed that a few of his tumors were consuming sugar.

Ken became a subject of new clinical trials focusing on other smart-drug possibilities. In late 2002 a new drug, SU 11248 (sunitinib), produced by Sugen Pharmaceuticals (now part of Pfizer), became available to Demetri for a special attempt to treat GIST. The drug had been designed to inhibit tumor blood flow, but laboratory studies showed that it also inhibited the activity of other cancer-causing enzyme proteins. Demetri decided to ask his patient to try the drug, and Ken accepted with alacrity. Although the tumors occasionally regressed or became much "colder," they slowly recovered. Then Ken would receive another combination of drugs or a single agent.

Ken maintained a strong, positive attitude. "I don't believe in that old saw 'When life gives you lemons, make lemonade,'" he told me. "I believe when life gives you lemons, it's lemon season—enjoy



January 2001: After Gleevec therapy, *no* tumor metabolic activity is evident in the scan; only normal heart and kidney activity is noted.

method for examining the chromosomes of cancer cells that had been induced to grow in a culture dish. They looked down their microscopes at the 22 pairs of non-sex-determining chromosomes of the blood cells of patients with chronic myelogenous leukemia (CML), and saw something remarkable. The pairs were normal *except* that, in every leukemic cell of every patient, one of the pair of chromosome 22s was even shorter than its small partner. For Nowell and Hungerford, the appearance of the chromosomes, particularly the easily discernible small 22 that became known as the Philadelphia chromosome, provided an important diagnostic test for CML.

Thirteen years later, Janet Rowley, a geneticist at the University of Chicago, looked even more carefully at the blood cells of CML patients and noticed that one of the pair of the larger chromosome 9s seemed longer than its partner. Within the next three decades, other scientists confirmed that the Philadelphia chromosome and the slightly longer chromosome 9 are due to breaks near the middle of chromosome 22 and at the tip of chromosome 9. A large fraction of one of the 22s is transferred to the tip of a chromosome 9 in exchange for a small hunk of the tip of the chromosome 9. Such exchanges are called reciprocal translocations.

Reciprocal translocations probably occur frequently in dividing cells. After all, every time a cell divides, 22 pairs of chromosomes and two sex-determining chromosomes line themselves up, duplicate, and dump themselves properly in the nuclei of dividing cells. There have to be occasional errors in such a complex process. Fortunately, the cells that bear such errors usually die. But some translocations, such as that which causes the Philadel-

No matter how "smart" a drug may be, all drugs are essentially poisons that interrupt metabolic pathways.

them. If you can smile with a lemon, the rest of it's downhill, the rest of it's just going to happen.

"I've tried to figure out the meaning of life since I was 10 years old," Ken continued. "It's been the point of my existence to answer it. Sometime around my fortieth birthday, I realized I was asking the wrong question. It's not, 'What's the meaning of life in general?' but, 'What's the meaning of *my* life?'"

Ken found answers in Viktor Frankel's book *Man's Search for Meaning*. "Frankel survived Auschwitz and came out with a philosophy of life that means something to me. We each have to find that meaning in our life. Maybe my meaning is to be a compass needle that points to Demetri...[maybe I'm here to] say to another confused and frightened cancer patient, 'Look, at least go to a cancer hospital with experts and get that second opinion. Demand that second opinion; get the experts, get the cutting-edge technology available to you.' If that's all my cancer does for me, that's okay. My life will be worthwhile if I have helped someone else."

Though Ken followed instructions to the letter, his tumors continued to grow even as new combinations, often including Gleevec, were administered. Both doctor and patient were bitterly disappointed, but Demetri maintained an optimistic stance. The Bristol Meyers Squibb drug desatinib, an excellent inhibitor of the enzyme that causes CML and very active against the enzyme that causes GIST, was now ready for clinical trials. Ken agreed to join a dose-escalation trial in the summer of 2004 and became the first solid tumor patient in the world to receive the new drug.

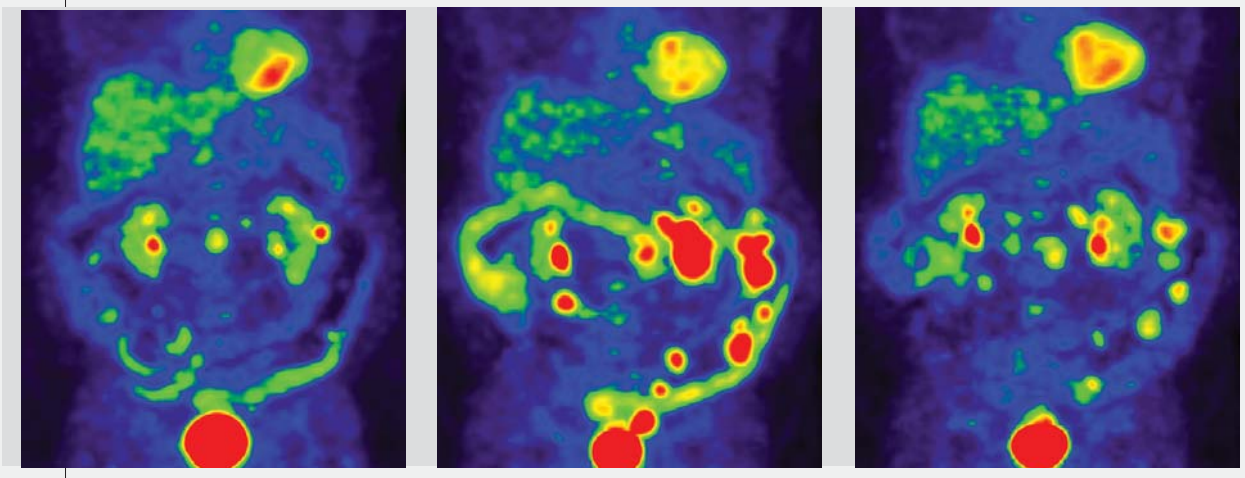
The course of the trial proved disappointing and discouraging. There were three immediate difficulties. First, a system of measurement had to be devised that would provide some quantitative assessment of tumor growth, because the PET and CT results could vary from day to day. Only measurements of trends over a prolonged period could provide accurate data. (PET scanners have become an expensive but absolutely necessary approach to measuring the responses of solid tumors to treatment. No other method gives as much information so quickly. But positron-labeled sugar is not an ideal detector because it is not specific for cancer. With more cancer-specific positron-emitting agents now in development, PET scanning will be much more accurate within a few years.)

The second difficulty was related. Because serial measurements were required to determine efficacy, the number of days required at each dose was necessarily very high. Each dose required a commitment of two months before the patient could move to the next dose, and the actual increments in dose were very small. Months could drift by with no evidence of any efficacy.

The most serious difficulty was a toxic side effect at higher

phia chromosome, favor a cell, and in the case of CML, the progeny of such survival-advantaged cells appropriate the bone marrow.

In the tip of chromosome 9 that is transferred to chromosome 22 is the normal tyrosine kinase gene c-abl. It produces one of the more than 500 kinases that normally work quietly together to regulate the growth of cells. CML is due to a single event in one bone marrow cell. In that cell, an innocent abl gene, yanked from its normal resting place on chromosome 9, is plastered onto the remaining bit of a broken chromosome 22 at a DNA site called bcr (for breakpoint cluster region). The forced union of bcr DNA with abl DNA on the Philadelphia chromosome forms an abnormal oncogene that produces a new and much longer fusion protein called bcr-abl. The latter forces the abl protein to signal continuously and stimulate cell growth. The result is chronic myelogenous leukemia. George Daley, then a young medical student in David Baltimore's laboratory at MIT, showed in 1990 that bcr-abl can cause leukemia by itself, just as activated kit can itself force a Cajal cell to form a gastrointestinal stromal tumor. Researchers have also found that many types of cancer develop from DNA mutations of other growth-promoting or death-pathway controlling genes. Modern cancer genetics thus has grown out of one simple observation made by three investigators peering down a microscope at the blood cell chromosomes in a rare leukemia.



June 2002: Gleevec therapy has controlled the cancer for more than two years. November 7: Multiple GIST metastases show increased activity, despite continuing Gleevec therapy at a higher dose. November 18: Multi-targeted therapy with a new drug, sunitinib, regains control of the cancer, temporarily.

An effective treatment for Ken's cancer emerged from an initial attack on the bcr-abl oncoprotein. Alex Matter, then a science

doses. The phase 1 trial focused on dose escalation in an effort to determine toxicity. As is the norm, *effectiveness* was secondary, relegated to a phase 2 trial once a tolerable dose had been found. Unfortunately, Ken began to experience serious psychiatric problems at the higher doses—and only at those doses was there any evidence, however uncertain, that the drug was shutting down the ability of his tumors to consume glucose. He became increasingly listless, his appetite declined, and he had persistent abdominal pain that he knew must be due to one or more tumors pressing on a nerve in his belly. He did not want to give up on the new drug, but pain and depression began to consume most of his waking hours. He thought of suicide.

Demetri sought an opinion from a psychiatrist who immediately diagnosed acute depression. The question that had to be faced was very complex. Was the depression due to the drug or due to abdominal pain and severe discouragement in a man who had expected the drug to relieve him? There was no obvious way to tell.

No matter how "smart" a drug may be, all drugs are essentially poisons that interrupt metabolic pathways. The purpose of a phase 1 clinical trial is to find a dose at which toxicity occurs, with the hope that therapeutic benefit is achieved at a lower dose. The therapeutic:toxic dose ratio of a drug is calculated by dividing the dose that achieves a favorable response by the dose that causes toxic side effects. The lower that ratio, the better the drug. But the ratio must be carefully described. Many forms of toxicity are of little consequence and patients usually tolerate them very well. Gleevec is such a drug. It does cause side effects, but almost all patients can live quite comfortably with the symptoms.

There is a further and entirely unpredictable aspect of the therapeutic:toxic dose ratio that may or may not be detected in a phase 1 clinical trial unless it involves a large number of patients. Though almost all individuals have the same complement of

George Demetri '78, M.D., pressed drug companies and an internal review board to gain access to experimental new therapies.

leader at Ciba-Geigy Pharmaceuticals in Switzerland, decided to launch a major research effort in the 1980s to find drugs that would inhibit tyrosine kinases that might be responsible for human cancers. For this purpose he required a cell line expressing a tyrosine kinase and an antibody that could detect the binding of phosphorus to tyrosine and hence activation of the kinase. He received both from Charles Stiles and Thomas Roberts at Dana-Farber Cancer Institute. Thus armed, Matter's team screened thousands of small molecules. They had a haystack of small molecules in which they would have to find one or two needles—drugs that would be readily absorbed in the gastrointestinal tract, penetrate cell membranes, block the access of ATP to the target tyrosine kinases, have very low toxicity, and be reasonably specific for the target tyrosine kinase. Incredibly, they discovered three compounds that seemed to work and reported on them in 1995. One of them, STI-571 (Signal Transduction Inhibitor-571), was particularly effective. It was soon named Gleevec (imatinib).

The next question was more complicated: what should Ciba Geigy do with the drug? Serendipity came to the rescue.

Brian Druker, a research fellow in the late 1980s in the Dana-Farber laboratory headed by Tom Roberts, had taken care of patients with chronic myelogenous leukemia and knew it was caused by a translocation that mutates the abl tyrosine kinase and makes it hyperactive. When he learned of STI-571, he wondered if the compound could also inhibit bcr-abl and thereby attack CML cells. He set about to convince Matter to develop STI-571 to treat CML.

Persuading Matter was relatively easy, but his superiors at Ciba (which became Novartis after a merger in 1996) couldn't see how all the expensive research could translate into a drug effective in cancer, especially for a relatively uncommon cancer. (CML afflicts perhaps 20,000 patients per year in the United States.) At the time, no clear evidence existed that overactive tyrosine kinases caused any of the major common cancers in humans. The development of a new drug is hugely expensive. Millions must be spent on toxicity trials in animals and in toxicity and early efficacy trials in people—and most drugs fail. Ciba could do far better by creating something for big-market problems such as coronary narrowing, pimples, hair loss, or limp erections.

Photograph by Sam Ogden

20,000 to 25,000 genes, there may be many variations in genes that affect the absorption of a drug from the gastrointestinal tract, its clearance from the circulation, its breakdown in the liver, excretion in the bile and the urine, or penetration of the organs such as the brain. Such genetic variations may lead to unique drug reactions in individual patients that are entirely unexpected and may occur without warning. These so-called idiosyncratic reactions are often unrelated to dosage and may produce severe toxic side effects. An entire field of medicine, pharmacogenetics, has developed to find ways to detect such patients before reactions occur.

Severe depression is not a common manifestation of desatinib toxicity, but Demetri had to conclude that the drug might have penetrated Ken's brain in some unique way and damaged the function of the delicate network of nerves that control emotion. Demetri had no choice. In late February 2005 he stopped the drug to see what would happen to Ken's spirits. Within a few days, Ken's depression lifted, his suicidal ideas vanished and, despite his abdominal pain, his optimism returned.

Demetri then decided to pursue a possibly useless gamble. He unleashed a drumbeat campaign to persuade Novartis to release yet another new drug, AMN107 (nilotinib), for a single-patient trial in Ken.

Pharmaceutical companies loathe single-patient drug trials. The chances of improvement of a single sick patient are small, but the chances of trouble and a complication that may or may not be due to the drug are high. An accumulation of toxic side effects in single patients from whom little useful clinical data could be obtained represents a foolish investment to any sensible pharmaceutical executive.

But Novartis had not often dealt with an investigator as persistent as Demetri. Scores of e-mails later, Novartis officials reluctantly agreed to allow him to treat Ken, and Demetri immediately petitioned the Dana-Farber institutional review board (IRB) to permit him to use the new drug. To his surprise and fury, the IRB wanted much more information first.

The life of a clinical investigator, a physician who wants to translate the fruits of biomedical science into patient care, can be discouraging. Arguments with pharmaceutical companies about the availability of new drugs in development, and endless debates with IRBs about the ethics of research protocols, can create incredible delays.

Prior to World War II, and for two or three decades after the war, physicians were largely free to use their own judgment and their own ethical standards to determine the suitability of a given patient for a particular research procedure. Clinical research flourished. But the demonic corruption of Nazi physicians and the shocking revelation that career officers of the United States Public Health Service had withheld penicillin from poor, uneducated black citizens of Tuskegee, Alabama, who were afflicted with syphilis destroyed that assumption. Congress heard cries for tighter regulation of clinical research. An initial trickle of rules became a torrent as more cases of research malfeasance emerged.

One of the best regulations was the creation of IRBs in 1979.

No one had ever seen a solid tumor stopped in its tracks by a single dose of any therapy. It would lead to a sea change in cancer therapy.

But Druker, now at Oregon Health Sciences University, persisted. In 1996 Matter finally gave him a small supply of STI-571 for lab studies—and it killed CML cells. Druker implored Matter to persuade Novartis to make enough of the drug for a phase-1 clinical trial. The trial, reported in 2001, proved hugely successful. CML patients went into remission with little or no toxicity—a magic bullet seemed to have arrived.

In 1999, George Demetri learned from Druker that Gleevec also shut down kit. Demetri immediately arranged a collaboration to determine whether Gleevec would kill GIST cells in a culture dish. The answer was strongly positive. Demetri still recounts the story with excitement. "I can't imagine a kinder or gentler way of killing cancer cells without injuring a patient. Why kill normal cells and hope that you happen to have a lot of the cancer cells in your field of treatment? Why pummel the patient with toxic chemotherapy? Why not just give a drug that helps the body get rid of mutated cells?...I wanted to start a trial of Gleevec immediately in gastrointestinal stromal tumors."

Demetri began a campaign to persuade Novartis to provide Gleevec for the treatment of GIST. A patient in Finland treated with Gleevec had shown remarkable improvement: a positron emission tomography (PET) scan utilizing radioactive sugar before and after one month of treatment showed that the tumors avidly consumed sugar before treatment but not afterward. The tumors were therefore dying. Subsequent CT scans showed that they were shrinking. "Nobody had ever seen anything like this," exulted Demetri, "and she had no side effects of any note."

The central management of Novartis was also impressed. They made Gleevec available to Demetri for what was to be a small clinical trial but turned out to be quite large: GIST is no less common than childhood leukemia, with perhaps 5,000 new cases a year in the United States. Scores of patients demanded access to the trial.

In the course of the trial, a second remarkable finding emerged: one dose of Gleevec could kill the cancer cells in just one day. That showed how dependent on kit GISTs can be. They may be wildly aggressive and unstoppable by carpet-bombing chemotherapy, but their Achilles heel is their utter dependence on kit for survival. No one had ever seen a solid tumor stopped in its tracks by a single dose of any therapy. The case offered proof that a concerted search for the pathways adopted by cancer cells to survive and a further search for smart drugs to block those pathways could be highly productive. It would lead to a sea change in cancer therapy.

The majority of the patients tested responded to Gleevec, although some were slower to respond than others. Eventually

COURTESY OF GEORGE DEMETRI

The Garabadians teasingly thanked Demetri for pulling rabbits out of a hat repeatedly on Ken's behalf.

Each grantee institution, usually an academic health center, was charged with forming a local IRB—a group of scientists, physicians, nurses, and local citizens whose task is to read a research proposal carefully and judge its ethical soundness. Close attention is paid to the quality of informed consent of the patient/subjects, and also to the research protocol, to be certain that the risk of the research does not approach or surpass its purported benefit.

Informed consent is a procedure in which the researcher or an agent of the researcher carefully explains the intended benefits and the attendant risks of a research proposal to a patient who will be the subject of that research. Such procedures are not unduly time consuming, and they are rewarding because they offer an opportunity for the physician to have an intimate discussion with a frightened patient who may gain a lot of reassurance from the encounter. The patient's questions may also uncover some areas of confusion in the research protocol, clarification of which can help the investigator to establish a better protocol or justify the one that is under discussion.

But urged by their apprehensive institutions to comply fully with informed consent procedures, physician scientists have gained "assistance" from institutional lawyers who help them to write documents that may be sound legally but often adopt arcane language that covers all perils; the result, of course, is nowhere near the quality of a simple conversation between the would-be researcher and the patient. So it is imperative for the physician or the physician's agent to write a note in plain English in the medical record that describes the conversation between the researcher and the patient in some detail. (Sadly, the requirement for such a note is often honored in the breach.)

In Demetri's case, the IRB wanted to be sure that a single-patient study could provide useful information. Many board members shared the skepticism of Novartis. (Though Dana-Farber

Demetri and his colleagues determined that the location of the mutation in the DNA sequence of a GIST-associated kit gene strongly influenced the quality and durability of response to the drug.

The most remarkable fact was that the treatment was only minimally toxic. Mild fluid retention, stomach distress, and some reduction in blood cell counts were the usual side effects. The complications of the treatment were acceptable because normal cells do not absolutely depend on kit for their survival: they enjoy a more complex interaction of signaling proteins that govern their growth. Only GISTs absolutely require mutant kit.

But there was a serious downside. Single-drug therapy of cancer is almost always associated with the development of a resistant population of cancer cells that finds a way to avoid the action of the drug, in this case by undergoing further mutations in the abl or kit molecules that prevent the drug from gaining access to them. CML and GIST cells inexorably become resistant to Gleevec.

The resistance to Gleevec by GIST cells has proven particularly devilish. The pocket or pouch in the kit tyrosine kinase molecule in which the drug sits and blocks access of ATP to tyrosine is lined by amino acids, the building blocks of proteins. If one or more of them is changed by further mutation, the drug may no longer fit in the pocket and therefore fails to function.

A pocket amino-acid mutation may occur secondarily to the pressure of the drug itself. But Charles Sawyers, an investigator at UCLA, has evidence that a very rare population of CML cells may contain a pocket mutation even before Gleevec treatment begins. Such cells become the dominant population when the sensitive CML cells are killed. That may well happen in GIST.

On the brighter side, investigators have fashioned other smart drugs to fit the mutated pocket or otherwise prevent resistance. A second approach is to add standard chemotherapy to the smart drug. Even if the carpet bombers do not work alone, they may be synergistic when added to Gleevec. Finally, researchers can take advantage of the fact that the kit signal passes through many relay stations on its way to the nucleus. Each relay station is governed by a signaling enzyme (often a kinase) produced by an independent gene. Drugs can be made that would attack the relay proteins, thereby targeting several key steps simultaneously in a signaling cascade that starts with kit and ends with growth and anti-death signals in the cell nucleus. Accordingly, in 2003 George Demetri started trying to combat drug resistance by working with new combinations of smart drugs. Given enough time, he thought he would find the right formula, and in Ken Garabadian he had found a patient eager to do his part in the fight.

Sadly, none of the several drugs that have already been designed to combat resistance worked for Ken, as they have for other patients. But we are only at the onset of the cancer-treatment revolution. The pipeline of drugs is just starting to flow. To paraphrase Churchill, "We are not at the beginning of the end, but we are at the end of the beginning." Given time and determination, physicians like George Demetri will see the fruits of their labors and patients like Ken will enjoy many more years with their families.

A CANCER BATTLEFIELD GLOSSARY

abl: A normal mammalian gene that produces a tyrosine kinase enzyme that promotes growth.

adenosine triphosphate (ATP): ATP, present in all cells, is formed when energy is released from food during cell metabolism. Cells contain enzymes such as tyrosine kinases that split ATP into ADP, phosphate, and energy, which is then available for cellular functions such as mitosis (cell division).

amino acid: Any of a class of nitrogenous organic compounds that are the building blocks of proteins and the end products of protein digestion.

bcr-abl: Oncogene and oncoprotein responsible for Philadelphia chromosome-positive chronic myelogenous (myelocytic) leukemia.

breakpoint cluster region (bcr): DNA on chromosome 22 that is the site of breakpoints that accept a fragment of chromosome 9 containing the abl gene. This translocation creates bcr-abl. The modified chromosome 22 is known as the Philadelphia chromosome and is diagnostic of chronic myelogenous leukemia.

c-abl: The normal abl gene, a proto-oncogene.

chromosomal translocation: The alteration of a chromosome by transfer of a portion of it either to another chromosome or to another portion of the same chromosome.

chromosome: A linear strand made of DNA and protein that carries genetic information. Genes are sequences of DNA that are largely contained within chromosomes. Normally present in the somatic (non-germ cells) of humans are 46 chromosomes, including two sex-determining chromosomes (either X and Y in males, or X and X in females).

chronic myelogenous leukemia (CML): A hematological malignancy that includes a specific cytogenetic anomaly—the Philadelphia chromosome—in the bone marrow and blood of more than 90 percent of patients.

computerized tomography (CT): A radiographic technique that selects a level in the body and blurs out structures above and below that plane, leaving a clear image of the selected anatomy.

deoxyribonucleic acid (DNA): Molecule that carries genetic information for all organisms except the RNA viruses. DNA consists of adenine, guanine, cytosine, thymine, deoxyribose, and phosphate.

enzyme: A protein capable of accelerating the chemical reaction of a substance (the substrate) without being destroyed or altered. Enzymes are reaction specific in that they act only on certain substrates.

gene: A gene consists of a sequence of base pairs in the DNA molecule which encodes the synthesis of one particular messenger RNA and protein molecule. Genes are the basic units of heredity.

gene expression: The process by which genetic information is converted into messenger RNA molecules and then into proteins.

genome: The complete set of genes on chromosomes, and thus the entire genetic information present in a cell.

imatinib (trade names: Gleevec, Glivec): An anticancer drug that inserts itself into the ATP binding pockets of the tyrosine kinase domains of bcr-abl and mutant kit, both oncoproteins. The drug binding prevents ATP access to the enzyme, and therefore blocks tyrosine kinase activity.

kinase: An enzyme protein that catalyzes the transfer of high energy phosphate from ATP to an acceptor or substrate such as a tyrosine molecule within the protein. If tyrosine is the substrate (acceptor) the enzyme is called a tyrosine kinase. If the tyrosine kinase is activated by another protein it is called a receptor tyrosine kinase. Kinase activity is central to the signaling processes that regulate cell growth.

kit: A receptor tyrosine kinase that regulates cell growth and differentiation through the cell signaling network. Mutations of kit are responsible for most cases of GIST.

mutation: A spontaneous or induced change in the DNA sequence of a gene in an individual organism. Most mutations are harmless but others lead to serious disease or disability.

oncogene: A gene that has the ability to induce tumor formation and malignancy. Proteins produced by these genes have tumor-promoting activity.

oncoprotein: A protein that is coded by an oncogene that may induce new and abnormal tissue formation such as a tumor.

Philadelphia chromosome: An abnormally short chromosome 22 in which there is a reciprocal translocation of the distal portion of its long arm to the long arm of chromosome 9 in exchange

had created that particular IRB, the members were entirely independent of the cancer center. They made up their own minds, and were free to demand any and all corrections as they saw fit.)

Seeing that a delay was inevitable, Demetri decided on a different tack. Ken had not taken Gleevec for two years. On the chance that a majority of his tumors had mutated enough to regain sensitivity to Gleevec, Demetri recommended a new course of that drug for Ken. To the delight of patient and physician, many of Ken's tumors grew "cold" on the PET scan after two weeks of Gleevec treatment and began to shrink. Ken's abdominal pain decreased. He felt like a new man again. Demetri, meanwhile, dealt with the criticism of the IRB and prepared to start Ken on AMN107 when the tumors inevitably mutated again and became Gleevec resistant.

While all this progress swirled around him, Ken remained reflective and philosophical. "I'm working and I'm trying to stay interested," he told me. "You certainly get distracted in a situation like this, where every two or three weeks there's a new protocol. By the same token, that's what I'm asked to do right now. I'm trying to do it with dignity.

"Of course it's not easy to be focused. I have to be in for checkups very frequently. So I don't have long periods when I do not think about the cancer and what is going on in me. But I always get a lift from this place. When friends tell me about cancers in the family, I always tell them, 'Just do yourself a favor, just call, get a second opinion. If you don't like Dana-Farber, go to M.D. Anderson, go to Memorial in New York, go to some other reputable hospital that specializes in cancer and cancer research.'"

I asked Ken whether he thought some patients avoid cancer

for the abl gene. It is found in leukocyte cultures of many patients with chronic myelogenous leukemia.

polymer: A natural or synthetic substance formed by a combination of two or more molecules of the same substance.

positron emission tomography (PET scan): A sectional view of the body using glucose labeled with positron-emitting radionuclides. Since cancer cells use glucose more avidly than most normal cells, PET is used to identify and localize tumors and determine their response to treatment.

protein: One of a large class of complex nitrogenous compounds that are synthesized by all living organisms and yield amino acids when hydrolyzed. Proteins are the products of genes, carry out critical metabolic reactions, induce movement, and regulate thought. They make us what we are.

proto-oncogene: A gene that regulates the growth of cells or the signals that cells send to each other. Mutations in proto-oncogenes convert the proto-oncogene to an oncogene that may cause excessive growth of cells or tissues in several diseases, particularly cancers.

RNA: Ribonucleic acid; a nucleic acid found in all living cells. RNA is involved in all stages of protein synthesis as well as in many regulatory and catalytic roles. It consists of adenine, guanaine, cytosine, uracil, ribose, and phosphoric acid.

smart drugs: Anticancer drugs that can target the mutant molecules that induce cancer and do no harm to their healthy counterparts.

src: The first transforming oncogene discovered. It is a mutant tyrosine kinase responsible for the Rous sarcoma in chickens.

tyrosine: An amino acid present in many proteins. It serves as an acceptor for high-energy phosphorus from ATP under the influence of tyrosine kinase.

tyrosine kinase: Any of a group of 90 enzymes that influence signaling between or within cells, particularly those signals that relate to cell growth and death, cellular adhesion and movement, and cellular differentiation. Activating mutations in tyrosine kinases are found in some human diseases, including chronic myelogenous leukemia and GIST.

tyrosine kinase inhibitor: A drug that interferes with tyrosine kinase function and therefore with cell communication and growth and may prevent tumor growth. Tyrosine kinase inhibitors are used to treat cancers that are driven by mutant or overexpressed tyrosine kinases.

centers because they are afraid of the word and afraid of the finality of coming to such a place.

"Sure, it's the reality—'I really have cancer,'" he said. "I think it's also about our perennial denial of how our own book ends. I know how my book ends. I know there's an Author writing it right now. My argument with Him is what page it ends on—but not how. And it's a one-sided argument. I'm saying, 'Not page 54!' He's going, 'Well, it's a mystery, my friend. At least for you.'

"But people are in such denial about it. Cancer is a disease where you're more afraid of the cure than the disease. They've seen the horror stories of chemo, and they're terrified. They saw Uncle Vinnie: 'Oh, his death was horrible; I'm not going to go that way.' Well, my God, you've got to try to beat the cancer as best you can, with as much dignity as you can, and not be afraid of the word 'cancer.'

"There are other words to be afraid of that are more debilitating to the human spirit than cancer. Fear is one of them; to live in fear your whole life, when you know the outcome. If this is going to be my last day, I want it to be a day of my authorship. You can't die with dignity if you don't live with it. So you have cancer, and you face it, and you say, 'I am going to try to hold my head up. I am going to go home tonight and cry maybe, but I'm going to try to spend 20 of these hours today with my head up'—as best I can."

I asked Ken how Peggy, who had insisted that he see George Demetri, was holding up during the long struggle.

"People meet my wife and they say, 'Sweet Peggy.' Peggy is this calm, gentle spirit. You would think she is Betty Crocker incarnate. She has been a tiger through this. She is my advocate and she's my guardian. She's got her moments of weakness, as I do, but we both try to do the same thing—we try to be prepared for the worst but to enjoy the best, while we have the best. And she's done a great job with that. She's done her best to live this thing true to her values. I think she's done a great job on that. I owe her everything. I owe her to keep trying to win. And I will!"

But Ken's will and upbeat philosophy could not stop the march of mutation in his tumors. They became resistant to Gleevec once again. The Novartis drug, AMN107, that had been so effective in CML, had no effect on the multiple GIST tumors in Ken's belly that grew until they impinged on the sensitive nerves in his abdomen. The pain became severe and Demetri had finally run out of new tricks for his patient. He wrote out prescriptions for pain relief and sent Ken home to spend his last days with his devoted Peggy. He died peacefully in the winter of 2005.

Ken was a persistent patient and George Demetri is a persistent physician. Together they marched down a century-old path of progress in basic biology that was translated in the 1980s and 1990s from neuroanatomy and viruses to an understanding of the plight of constipated mice and then to the mechanism of cancer in the specific cells that cause gastrointestinal stromal tumors. Ken was the direct beneficiary of that history, and became in turn part of the vanguard of smart-drug cancer treatment.

But his story also reiterates the absolute necessity for combination therapy to prevent drug resistance. Smart drugs like Gleevec will make cancer a treatable chronic disease—but we need more of them, we need to learn how to use them in combinations, and we need more knowledge of the pathways that cancer cells are forced to take to survive. Fortunately the stream of effective new smart drugs is growing. A cancer-treatment revolution has clearly begun. We must win that revolution for Ken and the patients who will follow him.

David G. Nathan '51, M.D. '55, president emeritus of Dana-Farber Cancer Institute and physician-in-chief emeritus of the Children's Hospital in Boston, is Stranahan Distinguished Professor of pediatrics and professor of medicine at Harvard Medical School. Nathan is the recipient of numerous awards, including the National Medal of Science, the Howland Medal of the American Pediatric Society, and the Kober Medal of the Association of American Physicians. He is a member of the Institute of Medicine of the National Academies of Science, the American Academy of Arts and Sciences, and the American Philosophical Society.

An "Oracle of Aqua"

Immersed in his favorite element

by Christopher Reed

"Ours is a society of sensual eunuchs, impotent to the callings of the wildness within and as a result, the pull of that which resides outside," writes Robert Lawrence France in his book *Deep Immersion: The Experience of Water*. "Transcending our minds, we must recognize that our bodies are the most concrete example of the natural world within our lives. The secret is to indulge in a phenomenological relationship with the world through direct experience mediated by the body in which we learn the texture, rhythm, and tastes of the physical world about us. In other words, we need to empower our eyes, skin, tongues, ears, and nostrils, and thereby awaken our bodies to truly experience the aliveness of this world."

France is adjunct associate professor of landscape ecology at the Harvard Graduate School of Design and a celebrant of water. Water is in such a bad way, he believes, that it has become impossible to celebrate it as an art form without also worrying about protecting it as a threatened element. He sees hope in the growing interest in ecological restoration. "The act of restoring, remediating—in other words, healing—degraded water is an act of reciprocity," he writes, "important not only for improving the quality of the outside environment of nature, but also that of the internal environment of the psyche, or human nature."

France refers to himself as an ecopsychologist. "The working precept of ecopsychology," he writes, "is based on the supposition that it is impossible to have well persons residing on a sick planet.... Ecopsychology...concerns itself with exploring the motivations, yearnings, needs, and ideals that shape and structure our lives within the environment, focusing on strengthening or even reawakening the reciprocal relationship."

France has been called by Lewis MacAdams—poet, journalist, and founder of Friends of the Los Angeles River—"an oracle of aqua." At a recent academic conference, a colleague introduced him as "Dr. Wet," and at another such gathering he was fumblingly characterized as a "psychoecologist." "There *are* people who are weird about water," he says merrily, "and I'm a quarter of the way through writing a book about them. Aquanuts. I'm not one of them. Not quite."

France is an expert on urban stormwater management, with an international practice. Engineers with an old-fashioned pipe mentality want to get stormwater into the sewers and out of town as quickly as possible, even if said town faces occasional or chronic water shortages. The rainwater that runs off the roads *is* bad stuff, he says, full of bacteria from dog excrement and toxic particles

Photograph by Jim Harrison

Were it not for an epiphany, France might have trained not as an aquatic biologist, but as an archaeologist.

shed by car tires and brake drums, nastier than wastewater from toilets, but France wants to channel it into rain gardens where it can be purified by vegetation. He wants to see porous pavements for driveways and parking lots to allow rainwater to enter the soil and stay in the watershed. He has written numerous scientific papers on the topic (and published, in all, more than 150 papers in peer-reviewed technical journals), organized a design school conference on "Ecological Engineering for Integrated Water Management," is series editor of *Integrative Studies in Water Management and Land Development*, and is the author of *Wetland Design: Principles and Practices for Landscape Architects and Land-use Planners*.

An adviser early on in the master-planning process for Harvard's new Allston campus, he is pleased to see that preliminary plans for the science complex to be built there do call for the buildings to capture stormwater for a variety of possible applications, such as irrigation of interior and exterior plantings, or for fire protection or other non-potable use in a good, "green," sustainable way (see "An Allston Metamorphosis?" November-December 2006, page 66). Moreover, he hopes that the Allston campus will be blue as well as green. Harvard's land, much of it a former salt marsh, once had numerous small creeks that later were covered over and became storm drains. In the spirit of present homage to the past while building a sustainable future, he might like to see some of those creeks "daylighted"—reborn as agreeable water features in the landscape.

The Alewife wetland at the north edge of Cambridge is "a microcosm of everything humans can do wrong with an environment," France says, yet it is both "a cherished and contested landscape." For what is now the Commonwealth's Department of Conservation and Recreation, he assembled a team of engineers and landscape architects and worked with them to develop a master plan for the 120-acre Alewife Brook Reservation. If or when the plan is fully implemented, it will transform the place—one of the largest urban wilds in Greater Boston—into a biologically diverse public park and wetland for cleansing Cambridge stormwater before it is released into the Alewife Brook and thence to the Mystic River and the sea.

France lives near Alewife in North Cambridge, a part of the city with a rich environmental and human history. As with most things that interest him, he hopes one day to write a book about it. At that north edge, Cambridge put its abattoirs, its flophouses, and famine-fleeing Irish immigrants, many of whom manned the brickworks that made many of Harvard's building blocks. In part of the Alewife drainage system lies Danehy Park, in earlier incarnations a wetland, a clay pit, and the city dump, but now 23 percent of the green space in Cambridge. France is a retained adviser to the city's Department of Public Works on stormwater-management issues, and has come to the rescue to help solve flooding at the base of the park. Danehy Park has become a model for similar reclamations elsewhere in the world, he reports. He and Niall Kirkwood, professor of landscape architecture and chair of the department, are working as consultants on a project to convert a mountain of garbage near the Tel Aviv airport, one of the highest garbage dumps on earth, into Ayalong Park during the next 10 years. "It will offer a spectacular view of the city," says France, who has climbed the mountain.

A CANADIAN, France got his bachelor of science degree from the University of Manitoba in zoology, went on for his master's to study the life-history response of the crayfish *Orconectes virilis* to acidification in the lakes of northwestern Ontario, and earned his Ph.D. at the University of Toronto with an ecotoxicological study of what acidification in softwater environments does to *Hyalella azteca*, a quarter-inch-long amphipod. Subsequently, for McGill University, he spent time in Canada's boreal forest studying how important the greenery along shorelines is to the ecology of lakes and rivers. Very important: aquatic animals in those cold climes depend on leaves and other detritus falling into the water to fuel the food webs in lakes and rivers, and on trees at the water's edge to stabilize thermal conditions—so clearcutting lumbermen had better leave a good buffer zone of trees around such bodies of water. That field work ended four years ago, papers have been written, and France's book about the study is forthcoming, "Aquatic Responses to Watershed Clearcutting: Implications for Forestry and Fisheries Management."

Were it not for an epiphany at age 13, following his observations of a pair of graduate students larking at scuba diving and getting course credit for it, France might have trained not as an aquatic biologist but as an archaeologist, for he finds much that fascinates him about 2000 B.C. He organized the design-school conference "Mesopotamian Marshes and Modern Development," about Iraq's Marsh Arabs, who were mightily assaulted by Saddam Hussein, using desertification as one of his weapons (see "Paradise Lost?" January-February 2005, page 30). France is contributing to and editing two scientific books to come out of that conference: "The Iraqi Marshlands: Restoration and Management" and "Rebuilding Cultural Landscapes Destroyed by Conflict and Natural Disasters." He edited *Wetlands of Mass Destruction: Ancient Presage for Contemporary Ecocide*, an outgrowth of the conference, and he is under contract to Harvard University Press for "Back to the Garden: Searching for Eden in the Mesopotamian Marshes," a summary account of these ancient Sumerian wetlands, the site of Gilgamesh's Flood and—at the confluence of the Tigris and Euphrates Rivers—paradise.

"Books are my drug," says France. He reads a great many of them, to which *Deep Immersion* attests. Its core is an exploration of how scores of contemporary nature writers convey their engagement with water in lakes, rivers, wetlands, springs, ephemeral pools, and the ocean, a section bracketed by essays built on wide reading about the importance of water in history, religion, literature, cinema, music, art, and architecture, and other chapters about ecological restoration and what might be called the landscape architecture of water, all revealing an addiction to the printed page. And he writes or edits, or intends to, a great many books himself. Prolific though he is, one marvels at his to-do list.

France is an acolyte of the sage of Walden Pond, Henry David Thoreau, A.B. 1837. How could he not be? He has edited *Reflecting Heaven: Thoreau on Water* and *Profitably* *(please turn to page 95)*

JOHN HARVARD'S

JOURNAL

Janelia Farm, the research campus of the Howard Hughes Medical Institute, is situated on 689 acres above the Potomac River in Ashburn, Virginia. The complex includes a main building about a thousand feet long (left), and a 100-room hotel (right) for conference visitors, as well as long-term housing (not shown).

The Janelia Experiment

Great scientific research organizations, of the rare variety that produce multiple Nobel Prize-caliber breakthroughs, share common traits that can be imitated. This is the precept behind the creation of Janelia Farm, the new biological-research campus of the Howard Hughes Medical Institute (HHMI). In November, scientists from the Harvard Stem Cell Institute visited the new campus, where everything from architecture to organization to social culture has been planned to nurture an optimal environment for scientific discovery. What the visitors saw may offer ideas for Harvard, which is planning an ambitious science-research campus in Allston and working to ensure that the organizational structure of the sciences, as well as the architecture of new buildings, will promote a culture of interdisciplinary collaboration.

In creating Janelia Farm, the planners relied heavily on historical precedent. "Every idea we have here, I can tell you who we stole it from," says molecular biologist Gerald M. Rubin, the director of the facility, with a laugh. A former Howard Hughes investigator himself, Rubin has been involved since 2000 in planning the new campus (pronounced *ja-nee-lia*, it is named for a former estate). HHMI, which

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Rendering © Rafael Viñoly Architects

has a $16-billion endowment, already provides $470 million a year to more than 300 top scientists at universities and research institutions throughout the country as part of its investigator program. Janelia Farm, with an annual budget of $80 million, was created to fill a perceived gap in the spectrum of research taking place in the United States. As Rubin wrote in the journal *Cell*, the domestic research portfolio has "shifted too far to the conservative." Largely missing, he feels, are research organizations equipped to tackle extremely difficult problems in biology that may require long-term interdisciplinary collaborations to solve—perhaps 15 or 20 years, a time horizon far longer than that of any government grant.

Such places did exist in the past. Both Bell Labs and the Medical Research Council Laboratory of Molecular Biology (LMB) in Cambridge, England, took a long-term approach to problem-solving, one in the physical sciences, the other in biology. Both produced results that were "offscale," Rubin says, "even compared to the best private institutions." Both were used as models for Janelia Farm.

Common to Bell Labs and the LMB were small research groups, leaders who were active bench scientists, internal funding for research, outstanding shared support and infrastructure, limited tenure, and a culture that rewarded collegiality and cooperation.

Sociological research, Rubin says, has shown that humans don't have meaningful interactions with more than about 20 people. "If you want to have interactions *between* groups and every group is 20 people, well, it's just not going to happen," says Rubin. "It's fundamental human nature." Thus groups at Janelia Farm, with its goal of increasing interdisciplinary cooperation between labs, are limited to no more than six members.

A recent HHMI survey of its investigators confirmed another of Rubin's suspicions: that most university science professors burdened with the administrative responsibilities of running a lab no longer have time to experiment themselves. "You won't find them with a pipette in their hand," he says. At Bell Labs and the LMB, senior scientific leaders worked alongside their junior colleagues, which resulted in excellent communication, collegiality, and mentoring.

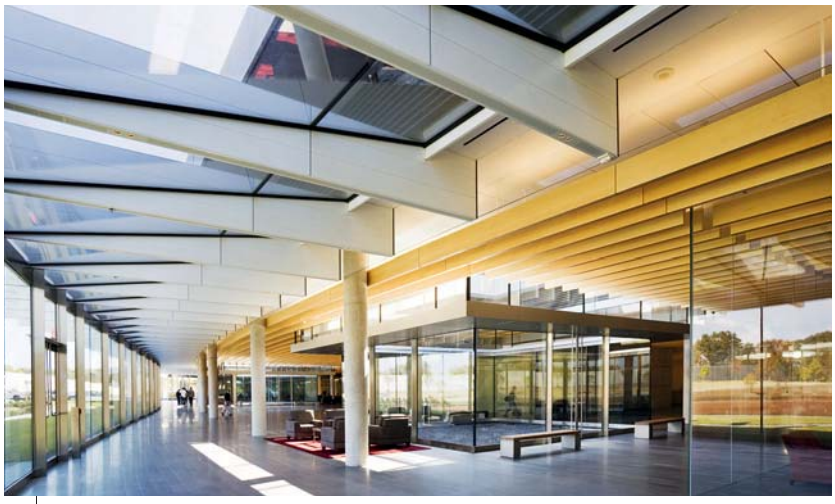
Internal funding and performance evaluation are other key elements in the very best research organizations, Rubin says. The bureaucratic rules and time horizons imposed by outside grants can make interdisciplinary collaboration difficult, as does an evaluation process that doesn't reward collaborative work. University tenure committees have traditionally had a hard time assessing someone whose primary work has been done in collaboration with others, especially across disciplines.

Bell Labs and the LMB also had high turnover, and tenure is anathema to that. Janelia Farm, which offers five-year renewable appointments to its 24 lab "group leaders," hopes to attract people who crave "the backing and the faith in them that you express by giving them a million dollars a year in research funding," says Rubin, "rather than giving them a salary for life."

The result is very unlike a university research environment—as it was meant to be. Rubin says the aim was to create a unique place. In fact, his "nightmare failure scenario" would be hearing someone comment, in 20 years' time, that HHMI had created another Whitehead or Salk Institute. Those freestanding research institutes are "best of class of their kind," says Rubin, but HHMI already funds scientists at both those institutions through its investigator program. Instead of spending $500 million to build Janelia Farm, "we could have funded another dozen people, if that was what we were trying to do." With the express aim of "funding science the way venture capitalists fund companies," as Rubin puts it, Janelia Farm is explicitly not a mainstream scientific model.

This venture-capital approach is not a good model for Harvard, Rubin emphasizes. Harvard has a teaching mission, relies heavily on short-duration govern-

The main "Landscape Building" is carved into a hillside and has nearly five acres of living, green roof, punctuated by square pods (left) that each house a lab group. Guest rooms in the hotel (below) look out over a small pond toward a hardwood forest.



Transparency, flexibility, and collaboration are aims of the building's design. Interior spaces (above left) bring the outdoors inside. In the labs (above), only the bollards with electrical and gas connections are fixed in position. Desks and benches can easily be reconfigured. The cafeteria (left) brings researchers together at mealtimes.

ment grants, makes promotion decisions by department based largely on published, peer-reviewed work, and grants tenure. Janelia Farm does none of these things. "And yet," Rubin allows, "there are certain things that one could look to us for and use as a guide to foster interdisciplinary work."

HARVARD, which will submit its institutional master plan for a new Allston campus in early January (see below), is poised to make major investments in science. A building complex to house the Harvard Stem Cell Institute and other initiatives is already in design, and several million additional square feet of academic science development is contemplated. In addition, a University planning committee for science and engineering has been meeting for the past year to devise organizational changes that might strengthen science across the University. Centralizing scientific appointments and creating incentives for interdisciplinary collaboration are among the group's priorities. At the same time, the Division of Engineering and Applied Sciences (DEAS) has grown rapidly while sustaining an unusual, nondepartmental administrative structure, thought to be a key to its success at fostering interdisciplinary collaboration within the physical sciences.

Yet even if the opportunities to create an organizational structure that promotes interdisciplinary collaboration are somewhat limited within the university environment, there is no such limitation on design and architecture that promotes collaboration. In this sense, Janelia Farm is also a model that blends lessons of the past with the most contemporary thinking in lab design. There are spaces that promote interaction: a cafeteria with good, inexpensive food, and a pub that serves coffee and tea during the day and cheeseburgers and beer after work. Forcing people out of their normal environments is a good thing, says Rubin. The LMB had a canteen and the culture there, he says, was that you were free to sit down with people you didn't know. (A 2004 study by the National Academy of Sciences asked research administrators what they would cut last in a hypothetical budget crunch. They overwhelmingly named their cafeteria.)

Because the primary building material at Janelia Farm is glass, there is a strong sense of connection with nature and its cycles nearly everywhere you go. Group leader Karel Svoboda, Ph.D. '94, says the building is very functional in key aspects, such as on rainy days when "the light is extraordinary. We don't always appreciate how much of an effect good light has on us." Many interior walls are glass as

Allston Plan Imminent

Harvard is expected to file with the City of Boston, early in January, an institutional master plan that maps out development of the Allston campus. A preliminary agreement of critical importance—relocating the Charlesview Apartments (a low-income housing project at the intersection of Western Avenue and North Harvard Street) to a 6.5-acre parcel near the Charles River—was announced in November. If approved, the transfer would give Harvard the entire block between Western Avenue, North Harvard Street, and the Charles River: thus enabling development of Allston to proceed around a focal point at Barry's Corner (the local name of the intersection), much as it has in Harvard Square. Sites for undergraduate housing, science buildings, relocated athletic fields, culture and performing-arts venues, and professional-school expansion are expected to be identified in the master plan. Visit the *Harvard Magazine* website in early January for updates (www.harvardmagazine.com).

Photographs © Jeff Goldberg/Esto

well, creating a transparency that makes it easy to find people. Not everyone would be comfortable in such an environment, Rubin acknowledges, but then he wants to hire people who *are* comfortable with the collaborative environment that transparent walls seek to promote.

A product of collaboration between HHMI's experienced lab designer, Robert McGhee, and the noted architect Rafael Viñoly, Janelia Farm is both avant-garde and highly functional and flexible. It had to be, says Rubin, because it was designed before its research focus—neuroprocessing and imaging—had been chosen. The lab setups can be easily reconfigured so that the physicists, computational scientists, and chemists (biologists are actually a minority) who work there can optimize their space. And the main hall in the building's lower level is big enough to admit a tractor trailer—just in case future research demands an oversized piece of equipment.

A final key ingredient in any great research organization is the people. Recruitment must be robust to attract the brightest talent. At Harvard, Venkatesh "Venky" Narayanamurti, a veteran of the Bell Labs culture who is now dean of DEAS, has also given some thought to the characteristics that make great scientific institutions run, and he emphasizes the importance of a good leader, an "orchestra conductor." By all accounts, Rubin fits the bill at Janelia Farm. But what about at Harvard? Says Venky, "Allston is a tremendous opportunity and one has to *orchestrate* it with great care."

The $3-Billion University

HARVARD came within an eyelash of crossing the $3-billion threshold in annual revenues and expenses for the fiscal year ended last June 30—and closed its books just barely in the black, after generating strong financial surpluses during the past several years. Revenues totaled $2.9996 billion—up $198.6 million, or 7.1 percent, from fiscal year 2005—but expenses grew even faster, to $2.9995 billion—up $242.1 million, or 8.8 percent. (The full annual financial report, published in November, appears at http://vpfweb.harvard.edu/annualfinancial.)

Elizabeth Mora

STEPHANIE MITCHELL/HARVARD NEWS OFFICE

Reviewing the results, vice president for finance Elizabeth Mora highlighted the signal importance of continued good investment performance on Harvard's $29.2 billion of endowment assets during a year of management and personnel change. ("Money-Management Makeover," November-December 2006, page 68, details the 16.7 percent investment return during the fiscal year.)

This focus is understandable for the University's chief financial officer (she was appointed to the post on a permanent basis by President Derek Bok on November 20). The $933.3 million distributed from the endowment for University operations rose 9.2 percent from the prior year—more rapidly than other major revenue sources (such as tuition and fees or gifts for current use), and more rapidly than during the prior year. (These figures *exclude* the additional $123.6 million distributed for the "strategic infrastructure fund," an assessment on all schools' endowments for property acquisition, planning, and ultimately development in Allston.) At the same time, other significant revenue streams are slowing.

Notably, direct federal support for sponsored research rose barely 3 percent to $378.5 million—down sharply from 7.5 percent growth during fiscal year 2005, and a cautionary sign of stagnant appropriations for the National Institutes of Health at a time when Harvard's population of scientific researchers competing for grants continues to expand. "We're certainly worried about that," Mora said. "NIH has dropped off the cliff," with the result that some investigators with long-term grants are suddenly finding renewals denied, or even rescinded after they are awarded. In some cases, that has forced the medical and public-health schools to use internal funds to support faculty members' laboratories. "When very strong people aren't being funded" because of federal budget constraints, Mora said, "it isn't good."

All categories of expenses rose, some sharply. Harvard's salary and wage bill grew 3 percent, to $1.13 billion, but employee benefits shot up 11.7 percent, to $350.6 million. Certain one-time items led to larger wage and lesser benefit growth during fiscal year 2005, but Mora said the trend in healthcare costs remains at 10 to 12 percent, foreshadowing continued pressure. Space and occupancy costs rose 15.6 percent, to $342.3 million, reflecting both new facilities coming on line and the punishing increase in energy costs during the past year. The "other expenses" line rose $106 million, 19 percent, to $663 million, despite the presence of a nonrecurring item in the 2005 financial statements (the $26.5 million payment to settle federal litigation over the Harvard Institute for International Development's advisory work in Russia). The largest new factor Mora cited for 2006 was $29 million in payments to MIT and the Broad Institute, a genomics-research joint venture managed and supported by Harvard and MIT (see "Bigger Biology," November-December 2006, page 72). That sum reflects both reimbursements to MIT and new gift funding directed to the Broad Institute through the University.

Close readers of footnotes will find a $17-billion reduction in holdings of var-

ious financial instruments purchased under hedge transactions, substantially offset by a reduction in cash collateral held under security-lending agreements. Both reflect the departure of fixed-income personnel from Harvard Management Company and the concomitant winding down of their arbitrage operations.

Looking at the balance sheet proper, the University's debt grew nominally, to $2.92 billion from $2.85 billion at the end of the prior fiscal year, a seeming respite from recent increases totaling at least a few hundred million dollars annually. But this may be simply a matter of timing: Harvard issued $417 million of new debt in July, just after the close of the fiscal year. Cash interest payments rose from $94.6 million in 2005 to $119.5 million in 2006.

Construction in progress in the Faculty of Arts and Sciences (see "House-Poor," page 58) and elsewhere assures further reliance on borrowing in the future; capital projects and acquisitions cost $422.5 million during the year. Mora said that the University has the capacity to borrow significantly more without jeopardizing its AAA bond rating; depending on the pace of Allston construction and renovation of the Fogg Art Museum, among other large projects, it may do so soon. As projects have come on line, she said, Harvard has been able to negotiate slightly more favorable reimbursement rates for indirect costs (facilities and other overhead) on federal research contracts, a crucial assumption underpinning FAS's financial projections.

Financial statements, of course, are merely a snapshot of operations. For Harvard, Mora stressed, this is a very dynamic era. Beyond the current construction sites, she cited extensive planning for new kinds of scientific research and new facilities to accommodate it—notably in the initial, large Allston complex (see "An Allston Metamorphosis?" November-December 2006, page 66).

She also noted the initiatives, from financial aid to adding faculty, that the schools have undertaken using the "supplemental" endowment distributions that they have been given in the past few years (see "Sharing the Wealth," March-April

HARVARD PORTRAIT

Erin O'Shea

"I have a personality that's like, if I'm going to do something, it's going to be done well, period," says Erin O'Shea. (That's why she gave up full-throttle golf. "I found it frustrating, hitting that little white ball around." Instead, she runs. She wakeboards. She and her husband, Douglas Jeffery, play a lot of bridge, as partners, with only a little bickering.) O'Shea has done much well. The professor of molecular and cellular biology, director of the FAS Center for Systems Biology, and Howard Hughes Medical Institute investigator studies how cells monitor the environment and respond to it, and attempts to decipher the logic of cell signaling and the regulation of gene expression, the processes that go awry in diseases such as cancer. In 2004, at 38, she was elected to the National Academy of Sciences, a rare honor for one so young. In 2005, Harvard lured O'Shea from the University of California, San Francisco, a medical school, partly because she wanted to teach undergraduates. "I realized that a large part of the success I have enjoyed is because of people who helped me when I was that age. My teaching and advising [she is coauthor of a new concentration, in chemical and physical biology] and having undergraduates in my lab [along with 16 graduate students and postdocs] have been the most rewarding aspect of being here. Hands down. I just finished a series of lectures in Life Sciences 1a with 630 students in the audience in Sanders Theatre, and it is a total thrill to stand up there in front of them and see them get so excited about science. I can't imagine a better thing to be doing. I'm actually shocked most people at Harvard don't realize this."

Photograph by Stu Rosner

2006, page 70). In fiscal year 2006, alongside "base" increases of 4 percent in their annual endowment distribution, schools could receive 4 percent more for priorities negotiated with the central administration and approved by the Corporation. In the current fiscal year, those figures rise to 5 percent and 6 percent respectively, followed by 5 percent and 7 percent in fiscal year 2008: very considerable sums on a base of more than $900 million, and crucial in an environment where gifts and federal research funds are uncertain.

In the midst of all these activities, Mora said, President Bok is driving hard to put in place policies and guidelines governing everything from seed funding for new science ventures to the use of the Allston infrastructure funds and the transfer of buildings owned by schools or units that will ultimately move there. The aim is to leave a clean slate for his successor, expected to be in place later this year.

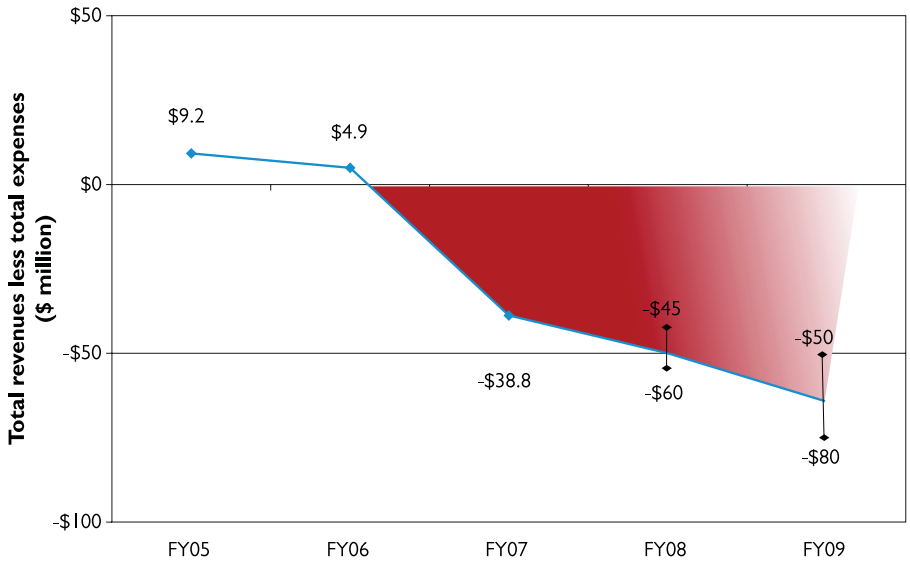
"House-Poor"

An unusual "Dean's Letter on the Finances of the Faculty," presented to the Faculty of Arts and Sciences (FAS) on October 17, during its first meeting of the year, details a significant "structural" deficit "consisting...of expense that has been permanently committed but not permanently funded." The letter, one in a series planned by interim dean Jeremy R. Knowles, largely confirms the darkening view of FAS's fisc outlined by its Resources Committee last January (see "Fraught Finances," March-April 2006, page 61).

But Knowles did not explicitly embrace the assumptions made then about how the gap could be filled through greater reliance on endowment distributions, future fundraising, and recovery of indirect costs (overhead) on federally sponsored research. Instead, he sought to provide clear information so the faculty could "face the same horizon of challenges together" and then make appropriate financial choices in concert with "my less impermanent successor"—the next FAS dean, to be appointed by Harvard's next president. (The text of the letter appears at www.fas.harvard.edu/home/administration/communications.html.)

In his letter and presentation, Knowles stressed the progress FAS has made, in pursuit of which it has increased costs. "[W]e have advanced remarkably in the last few years, growing the faculty, entering new fields of enquiry and strengthening others, and improving the support and the opportunities available to our students," he wrote. The number of regular faculty members, for instance, has risen steadily, jumping from 663 to 719 during the past three academic years alone.

In answer to a question, he described FAS as being in "a *very* strong position," enjoying "*enormous* support" from its endowment, valued at $2.2 billion when Knowles first became dean in 1991, and at $13.2 billion now. The share of FAS income from endowment distributions has risen from one-third to nearly one-half during that period.



But even those strengths cannot support the full expense of augmenting the faculty or of equipping them for their work, particularly in the sciences. The cost of new buildings recently completed or still under construction totals $740 million, nearly all of which will be borrowed. FAS's outstanding debt will nearly triple, to $1.2 billion from $450 million today. Interest and principal payments and operating costs just for the new construction are forecast to rise nearly tenfold, from $8.5 million in fiscal year 2006 to $81 million in fiscal year 2010. In other words, as Knowles wrote, "[T]he most significant elements of our rising expense budget are the costs of bringing new colleagues to Harvard, sustaining them, and providing space and facilities in which they can flourish." Hence, in response to a Resources Committee query about whether FAS would become "house-poor," he wrote, "The honest answer is 'yes, for quite a while.'"

Other costs are rising, too: financial aid, efforts to promote study abroad, new student facilities, and further changes stemming from the undergraduate curriculum review. Therefore, "our projected deficits are not short-term gaps that can be filled by temporary belt-tightening." As shown in the accompanying graph, FAS is staring at deficits beginning now, and reaching as much as $50 million to $80 million annually within two more years.

Knowles was able to report some unexpectedly good news: instead of a projected $40 million deficit in the fiscal year ended last June, FAS recorded a modest surplus of $4.9 million (revenue totaled $958 million, up 10.4 percent from fiscal year 2005). Some of that reflects slower-than-anticipated hirings of additional faculty members. Cost controls and redirection of certain reserves and fund balances contributed, too: Knowles estimates gains of $7 million to $9 million in

Graph courtesy of FAS Dean's Letter/October 2006

the current year from such efforts, and is searching for $5 millon to $7 million more during the next three years. It also appears that FAS was able to take better advantage of extra, "strategic" distributions from the endowment for purposes approved by the Corporation, and that faculty members did relatively well in securing external grants for their research.

Looking ahead, Knowles cautioned colleagues to "decide how much further we wish to grow," even as the faculty tries to alter its disciplinary balance somewhat. That is, having identified a need to grow in life science and engineering, and having taken on debt to accommodate additional professors in those fields, "it would be irrational now to halt the recruitment of colleagues who will both contribute to our overall intellectual goals, and (more practically) secure grants—the indirect cost recovery on which will help to pay for the new construction."

In other words, having analyzed prospective long-term deficits, Knowles does not prescribe an overall solution. He intends, rather, to help hold the line until his successor plots new priorities. For the foreseeable future, then, FAS is committed to faculty growth and the associated costs of new facilities—with the hope that better-than-forecast outcomes from any or all of its sources of revenue will lessen the pain of its house-poor period.

A New Script for One L

THE EXPERIENCE of first-year students at Harvard Law School, famously chronicled by survivors Scott Turow, J.D. '78, in *One L*, and John J. Osborn Jr. '67, J.D. '70, in *The Paper Chase*, has not changed significantly in one respect—the curriculum—for more than a century. That's a bit too much stability, the faculty has decided, voting unanimously on October 5 for an overhaul.

The present course of study was established in essence in 1870, along with the case method of teaching, by the school's pathbreaking dean, Christopher Columbus Langdell, and it was so widely influential that a similar drill is

Yesterday's News

From the pages of the *Harvard Alumni Bulletin* and *Harvard Magazine*

1917 T. W. Lamont '92, chairman of the Harvard Endowment Committee, announces a novel plan to raise $10 million for the permanent endowment by appealing, for the first time, to all alumni and to "believers in Harvard other than its own sons," rather than to a limited number of wealthy benefactors.

1932 The Graduate School of Education, with Carnegie Foundation funding, is trying to determine the value of mechanical aids in classrooms, including the use of "talking films" in junior high schools as a means of improving science instruction.

1947 President Conant, in his annual report, advocates continuing federal support for professional training, especially in the sciences, but warns against any University connection in peacetime with "secret research or development."

The *Bulletin* calls Harvard a bargain among prestigious schools in the Northeast, despite its "rich man's college" reputation: it now costs a total of $494 a semester, compared to $502.50 at Princeton, $524.50 at Williams, $544.50 at Columbia, and $650 at Yale.

1962 Some 200 Harvard and Radcliffe students join several thousand other undergraduates in picketing the White House, demanding a "Turn Toward Peace." The *Crimson* complains that any worthwhile ideas that the students may have are being jeopardized by their tactic of mass protest.

1967 As an experiment, Lamont Library will be open in the spring term to Radcliffe undergraduates and Harvard's 650 women graduate students.

1972 In his first annual report, President Derek Bok asserts that recent upheavals at Harvard have led to an unanticipated development—a heightened sensitivity among the University's separate faculties to each other's interests and problems. "However painful the circumstances," he writes, "barriers were broken down in ways that will serve the University well in future years."

1992 Some 1,800 "shoppers" attend the first meeting of "Contemporary African-American Cinema," offered by visiting lecturer in Afro-American studies Shelton J. (Spike) Lee. His enrollment limit for the course is 60.

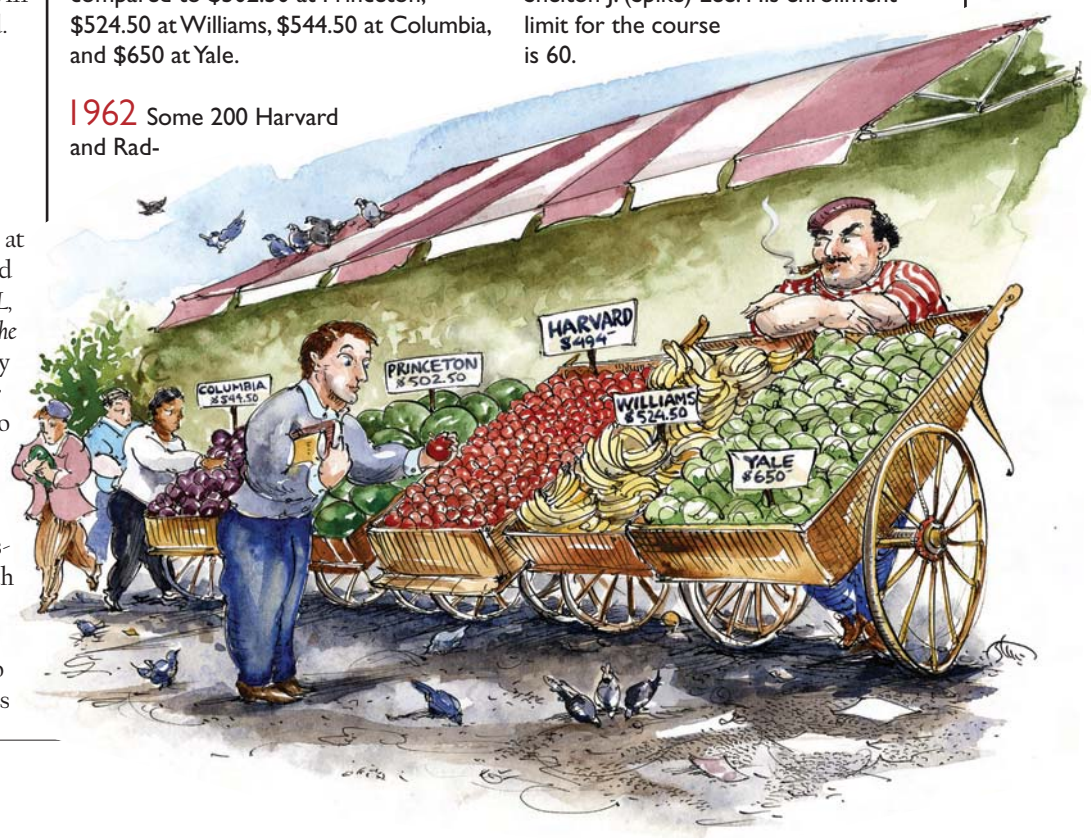


Illustration by Mark Steele

familiar to students at most U.S. law schools. It focuses on contracts, torts, civil procedure, criminal law, and property. Henceforth at Harvard, less time will be given to these classic topics to make room for new required first-year courses to be phased in during the coming three academic years:

- "Legislation and Regulation." This course will plunge students into the modern regulatory state. Traditionally, incipient lawyers have taken their lessons mostly from close reading of appellate court decisions. Now they will read statutes as well and consider the immense amount of law made by legislatures and administrative agencies concerned with environmental protection, food and drug law, consumer protection, and the like. They will begin to fathom the processes of government.
- International/comparative courses. A student will choose one of three offerings designed to provide wider-world context for U.S. law. A course on public international law will explore the institutions and procedures that emerge through bilateral and multilateral arrangements among states, sometimes with the participation of nongovernmental actors. Another on international economic law will expose students to the network of economic regulation affecting commercial transactions, trade, banking, and other economic relations around the globe. A third course, on comparative law, will introduce U.S. students to one or more legal cultures different from the homegrown one.
- "Problems and Theories." The idea here is to teach students to think like clients. "Lawyers increasingly do not just litigate and parse texts," says Einer Elhauge, Petrie professor of law and director of the Program in Law, Medicine, and Bioethics. "They negotiate, theorize about the cause of problems, and devise solutions to them that may or may not involve law." In addition to the Socratic questioning historically employed by law professors, the pedagogues of this course will use role playing, brainstorming in small groups, mock litigation, lectures, and other techniques as well.

STEPHEN ANDERSON

"The idea is to make sure that our graduates are not only great advocates, but great problem solvers," says the dean of the school, Elena Kagan, J.D. '86. "That means giving our students the experience of dealing with the sort of messy situations that arise in the world, which require consideration of multiple bodies of law, complicated and often disputed facts, and questions of both ethical and practical judgment. The best lawyers and the best leaders are people who think wisely, rigorously, and creatively about how to deal with these kinds of problems, and that's what this course is meant to equip our students to do."

The academic calendar for 1Ls will change to duplicate that of the rest of the school, with a three-week January term for intensive study in a single field. The "Problems and Theories" course will begin full blast in January and continue less intensively in the spring term. (Students will take examinations for first-term work before the holiday break, instead of after it as they do now, allowing more wholehearted attention to plum pudding.)

"I believe we have put in place a combination of reforms that no one else has done," says Martha Minow, Smith professor of law, who chaired the faculty committee that developed the new curriculum. "Many of its elements have been available at other law schools in some form as an elective part of the upper-level curriculum, but not built specifically for first-year law students or required for all."

"The faculty voted to require these courses," says Kagan, "because they are foundational in every sense—fully as important as the traditional first-year courses to becoming a skilled lawyer in the twenty-first century. When we say that some courses are required and others elective, we are implicitly saying that the latter are less important. But these new courses are not less important. They are essential aspects of legal training in our time."

The faculty intends the upperclass years to foster close encounters with chosen fields. Last spring it adopted a reform proposed by Minow's committee to develop several "programs of study." These, she explains, are "entirely elective patterns of courses, clinical offerings, and advanced work to build progression in the curriculum. They will provide advice for students and planning vehicles for faculty. The programs of study that we will launch initially are in law, science, and technology; law and social change; law and business; law and government; and international and comparative law. Others may well follow." (The school offers more than 250 elective courses each year.)

"Given how much the legal world has changed since 1870," says Kagan, "the need for change in legal education should be obvious. Law schools have been slow to change, not because they think the current curriculum is the best one, but because it's been the easiest one."

Photograph by George Simian

Legal Legroom

Way back in 1998, a committee of faculty and administrators at Harvard Law School (HLS) began work on strategic planning for the school's future needs, a task linking prospective academic growth to anticipated physical-space requirements. One idea the group explored was burying the Everett Street garage and erecting a new building above it. Then, in the summer of 1999, the possibility of moving the entire school to Allston was raised, and plans for expansion in Cambridge were put on hold. Now an end to the school's long wait for additional space is in sight: construction will begin in June on a 250,000-square-foot building, designed by architect Robert A. M. Stern, that Dean Elena Kagan expects will meet the needs of the school for the next several decades.

An aerial view of the proposed new building, looking northwest from a vantage point above the Science Center

The south corner of the proposed Northwest Corner building, with Pound Hall on the right, as seen from the opposite side of Massachusetts Avenue; the site today

Dubbed for the moment the Northwest Corner, the building will house seven new classrooms, a student lounge, and a pub linked to the dining area in the recently renovated Harkness Commons building, as well as space for student extracurricular activities—in particular, student journals. Stern has blended historic and modern design elements reminiscent of existing HLS architecture, such as that seen in Austin and Langdell Halls. Construction will begin with the demolition of the Everett Street parking garage and Wyeth Hall dormitory. Two wood-frame buildings will then be moved up Massachusetts Avenue, next to North Hall, to create space for the construction of an underground parking facility, above which the new building will rise in three years' time.

The adoption of these reforms follows a process that began soon after Kagan became dean in 2003. She made the curriculum a topic of conversation at the small dinners she held during her first year, to which eventually every faculty member was invited. "We pursued many settings for consultation—lunches, small groups organized by subject matter, regular faculty meetings," says Minow. "We gave repeated updates to the faculty and developed a set of alternative proposals that were debated at a faculty meeting last spring, all before the vote this fall." Minow's committee had a shifting membership over a three-year period, but she and Kagan attended every meeting.

Among ideas considered but rejected, Minow says, were "concentrations" instead of programs of study in the upper years. They also considered moving one or more of the traditional required first-year courses out of that year or even out of the set of required courses. "We thought of combining the courses on contracts, torts, and property into one on the common law," she notes. "In the proposal adopted by the faculty there is a directive to the deans to permit faculty who would like to experiment with collaborating across course lines to do so."

The unanimous vote this fall was cast by about 70 percent of the 84 tenured or tenure-track faculty. "I think their unanimity," says Elhauge, "reflects a combination of a long process of serious consultation in which faculty input was taken seriously and incorporated into the final creative proposal, a very collaborative attitude among the faculty where they were willing to sacrifice vested interests for the greater good, and an amazing level of confidence in how the dean would implement the necessarily general propositions we voted on."

Education for Life

After three years of inconclusive work on a new general-education component for the College, the Faculty of Arts and Sciences (FAS) appears to be debating seriously a proposal that would replace the current Core curriculum. The Core, adopted in 1978, focuses on "approaches to knowledge" within major disciplines (see http://webdocs.registrar.fas.harvard.edu/courses/core). The faculty showed little enthusiasm for a proposal, advanced last year, to supplant the Core with a loose distribution system (requiring only that students take three courses each from humanities, social sciences, and natural sciences).

Now, FAS is focusing on a new set of requirements and new kinds of courses, intended to "help [Harvard students] to find their way and to meet their responsibilities by providing a curriculum that is responsive to the conditions of the twenty-first century." So wrote the Task Force on General Education (TFGE), commissioned last spring, in a preliminary report released on October 3 (see www.fas.harvard.edu/%7Esecfas/Gen_Ed

Renderings courtesy of Robert A.M. Stern Architects. Photograph by Stu Rosner


Alison Simmons

STU ROSNER

_Prelim_Report.htm.). The committee's work, discussed in an FAS meeting on November 14, has prompted lively exchanges about the purposes of undergraduate education and the means to achieve them.

The task-force members began their work by "spelling out a clear rationale" for general education, their cochair Alison Simmons, professor of philosophy, told the meeting. That rationale, she said, is grounded in the conviction that a liberal-arts education matters to students because it makes them more reflective about their beliefs and choices, more self-conscious and critical, more creative in solving problems, and more perceptive of the larger world. (Departmental courses taken for concentrations and as electives, the October report says, are the essence of "liberal learning—that is, of free inquiry undertaken without concern for topical relevance or vocational utility. This kind of knowledge is not only one of the enrichments of existence; it is one of the achievements of civilization.")

Apart from this opportunity to learn about and reflect upon "the human and natural worlds we inhabit," however, "college is also a preparation for the rest of life," in both subject matter and "skills and habits of mind." The authors emphasize that they are *not* suggesting a utilitarian, pre-professional education. But with more than half of graduating seniors heading for professional school, they intend general education to be "the place where students are brought to understand how *everything* that we teach in the liberal arts and sciences relates to their lives and to the world that they will confront. General education is the public face of liberal education."

In this context, the task-force members wrote to colleagues, the Core curriculum should be replaced, because shifting disciplinary boundaries and the reality that only a small minority of College graduates pursue academic careers have undercut its rationale. "Distribution requirements," they found, fail to distinguish

Curriculum, Classroom, Competence

While acknowledging that the curriculum is the faculty's "sacred domain," President Derek Bok nonetheless said at the October 17 meeting of the Faculty of Arts and Sciences that Harvard could make a special contribution to undergraduate education now, and if it could do so this year, that would make him "incredibly happy"—comments that won loud applause.

That said, Bok has made clear that he considers the sequence of courses only one element of education, and not necessarily the most important. On several occasions during the fall term, he highlighted the importance of changes in advising, now taking hold, and of incentives for better teaching—the subject of the separate Task Force on Teaching and Career Development (see "Taking Teaching Seriously," November-December 2006, page 60).

Finally, Bok has long advocated assessment—objective measurement of learning outcomes—as the basis for iterative improvements in course design and pedagogy, most recently in his book *Our Underachieving Colleges*, published last winter. Bok's unexpected return to the presidency has given him the opportunity to put the idea into practice.

According to Nina Zipser, the University's director of institutional research, about 315 freshmen this autumn took the Collegiate Learning Assessment (CLA), a sophisticated examination of critical-thinking ability developed by the Council for Aid to Education and researchers at RAND Corporation (www.cae.org/content/pro_collegiate.htm). Students may be asked, for instance, to advise a corporate executive about the purchase of an airplane, based on evidence about the aircraft model and an account of a recent accident. Their written argument is then evaluated using more sophisticated criteria than can be captured in multiple-choice exams. A similar-sized cohort of seniors will take the CLA this spring. Comparative analysis will then suggest, in a rough way, how students in the humanities, social sciences, and sciences progress in acquiring critical-thinking skills during their College years, and how they compare to students elsewhere.

Zipser noted that this small sample cannot compare the same group of students over time, nor provide insights into specific fields of study. But it will give some sense of the utility of the CLA assessments, which are being used at dozens of schools. (Duke, for example, has tied the CLA to its own activity-based learning in upper-level social sciences programs; that might be a model for current general-education experiments at Harvard College.) And the CLA, Zipser added, is unlike any kind of assessment the College does now. As such, this small initiative prompted by Bok might be the starting point for much larger changes in Harvard's future learning culture.

general-education from concentration courses. As for a "great books" approach, they concluded that "it has become effectively impossible to reach agreement on a single canon of knowledge (leaving aside whether it is desirable to do so)"—nor would such a unified course of study be "compatible with Harvard's institutional DNA, which values expertise and, we think, an engaged and outward-looking approach to learning."

The rationale that stood out, Simmons reminded the faculty, is defining general education as a way of making explicit "the value of a liberal-arts education for life."

The task force members then fleshed out that construct by outlining seven subjects and three skills in which students would be required to complete courses. They drew in part on their own expertise. (In addition to Simmons, the members are: Stephen M. Kosslyn, Lindsley professor of psychology; David R. Liu, professor of chemistry and chemical biology; Louis Menand, Bass professor of English and American literature and language, the second cochair; David R. Pilbeam, Ford professor of human evolution; and Mary C. Waters, Zukerman professor of sociology. They were joined in September by Ryan A. Peterson '08 and Limor S. Spector '07. Stephanie H. Kenen, assistant dean and lecturer on the history of science, served ex officio and provided staff support.) But they also consulted widely with fellow professors—a process that continued throughout the fall.

> Simmons defined general education as a form of "liberal-arts education for life."

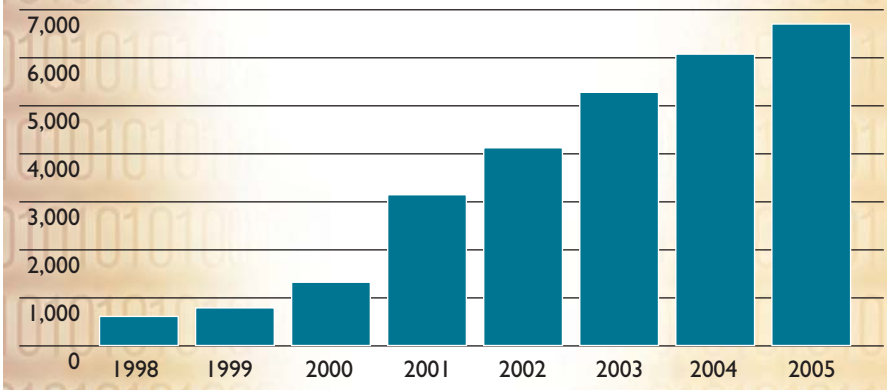
The October draft recommends that students be required to take seven half courses in five "broad areas of inquiry and experience" (with suggested new and existing course offerings in each):

- cultural traditions and cultural change, spanning literature, music, the arts, classics, and associated fields;
- the ethical life, addressing moral reasoning and ethical theory—for example, by investigating medical dilemmas or problems in global justice;
- the United States and the world, with two courses, one providing perspective on American history or institutions in global context, and one putting other societies in perspective and in relation to a world of which the U.S. is a part;
- reason and faith, addressing the reality that religion is "a fact of twenty-first-

HARVARD BY THE NUMBERS

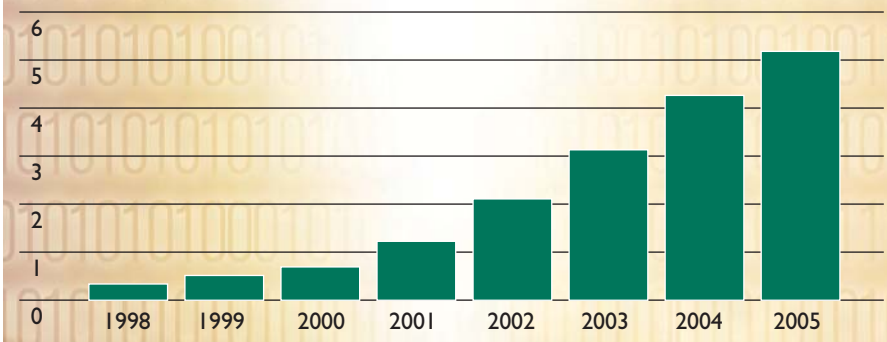
INCREASINGLY ELECTRONIC LIBRARIES. From 1998 through 2005, University library holdings increased by 1.62 million volumes—11.6 percent. But during the same period, the number of "e-resources" grew tenfold, and now include more than 15,000 on-line journal titles. Researchers are accessing these holdings ever more frequently, with individual uses of e-resources rising to nearly 5.2 million in 2005 alone.

E-Resources



Article databases and indexes, encyclopedias, e-book and e-journal collections, and other electronic resources; e-journal collections include more than 15,000 individual titles.

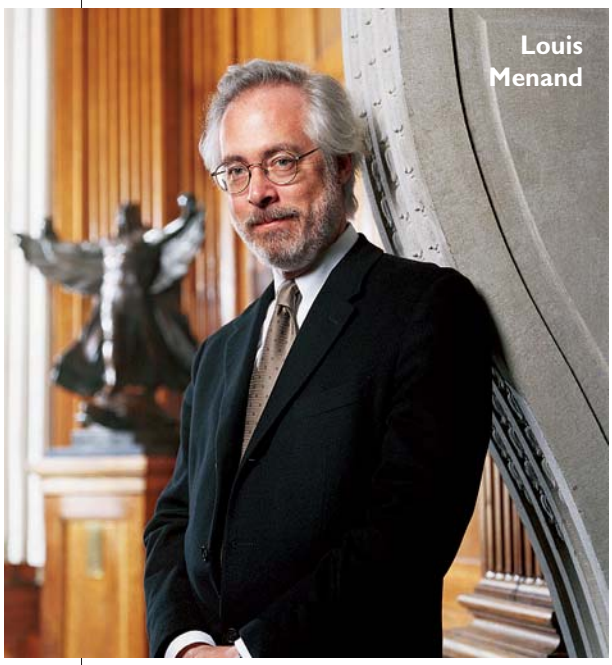
Use of E-Resources (in millions)



Includes individual user sessions on e-resources delivered through http://lib.harvard.edu

Source: Harvard University Library 2005 Report

Chart by Stephen Anderson



STU ROSNER

century life" as well as "*realpolitik*," so that students "understand the interplay between religious and secular institutions, practices, and ideas"; and

• science and technology, introducing key concepts, their social context, and methods of inquiry through courses in life science and in physical science.

Complementing these substantive requirements would be three half courses aimed at developing critical skills in written and oral communication; foreign language; and analytical reasoning (statistics, game theory, and the like). The task force also urges FAS to "launch an initiative in activity-based learning" that could become an added component of general education, linking course work to extracurricular activity in a way to be specified by a separate committee.

Overall, the proposal departs sharply from the faculty's earlier focus on reducing requirements and liberalizing students' range of choice, apart from any vision of *what* they should learn from their non-concentration coursework, or *how*.

Reactions to the TFGE proposal addressed both its rationale for general education and the specific course requirements. At the FAS meeting, Beren professor of economics N. Gregory Mankiw said that, given the competing visions of general education, it would be best to forgo a vision for the curriculum and have students acquire some degree of breadth in their studies. Reid professor of English and American literature Philip Fisher focused on what he felt a University faculty does best—teaching methods of inquiry—and so advocated something along the lines of an updated Core curriculum. Wolfson professor of Jewish studies Jay M. Harris put the issue in its broadest context: should general education be defined by disciplines and their methodologies, or by broader areas of inquiry (which might well be inter- or multidisciplinary)? He opted for the latter, and most participants in the debate seemed, at least implicitly, to agree.

The broadest critique of the proposed requirements was that the task force had, in effect, drawn up a post-9/11 curriculum, too shaped by current events. Loker professor of English James Simpson told how, in a task-force briefing for his department, he had characterized the envisioned general education as "presentist" (focusing only on recent decades) and "managerial" (reducing education to application), with too little room left for study in the humanities. Olshan professor of economics John Y. Campbell thought the study of human behavior was and ought to be considered scientific, a search for universal principles; Buttenwieser University Professor Stanley Hoffmann replied that people are "extremely different," and that the task force had gotten the balance about right, even though the faculty would surely "haggle" about details. Several speakers, from diverse disciplines, wanted some required exposure to economics. Others worried that "faith" and "reason" were uncomfortably juxtaposed in the academic context, or that the course descriptions were excessively U.S.-centric.

The haggling, though, seemed aimed principally at refining the task force's vision. Indeed, Simpson said he had voiced his criticisms chiefly to put them on the record; a letter by the task force prepared for the faculty meeting showed how much its thinking had benefited from consultations, and addressed many of his objections.

In that letter, dated November 9, the task-force members noted that the "historical, comparative, and theoretical perspectives that liberal education provides" could enlighten and empower students for the rest of their lives. In describing general-education courses using "present-day topics" as examples, the members wrote that they did not intend to prescribe subject matter, but only to remind professors that connections between class content and the real world could be an effective pedagogical device (as in the new introductory life-sciences and physical-sciences sequences). As for including more work in humanities (both the study of culture and the development of students' critical and aesthetic understanding), the task force said, "We agree."

Concluding the November 14 meeting, task-force cochair Menand said, "[T]he main hope the group had was that the faculty would be able to have a substantive discussion about what general education ought to be. We are having that discussion." If the momentum persists (see www.harvardmagazine.com for updates), FAS may be able to legislate this spring, thus turning from plans for a new curriculum toward implementation.

Medicine Man

When Joseph B. Martin relinquishes the deanship of Harvard Medical School (HMS) at the end of the academic year—a decision announced on October 5—he will have put in place a new curriculum and the enormous New Research Building: tangible evidence of the school's teaching and scientific missions. But much behind-the-scenes work—reconstructing the relationship between HMS and its affiliated hospitals, planning for the conduct of basic science and clinical activity—underlay those advances, and will continue to shape Harvard's extensive biomedical work in the next decade.

During a mid-November conversation reviewing his service as dean since 1997, Martin focused first on the revamped curriculum, a new approach "driven by the changes in the healthcare system." The

hospitals' pursuit of "high-occupancy, high-throughput" medicine has made it much harder for students to get the extended exposure to patients that they need to gain proficiency. By shifting from a series of rotations among as many as seven institutions to immersion in one during their third, clinical year of medical study, students gain opportunities to follow patients in depth, understand the organizational context of medicine, and develop relationships with their mentors (see "The Pulse of a New Medical Curriculum," September-October 2006, page 64, for a detailed report). Reaction has been "appreciative and enthusiastic," Martin said. Meanwhile, the first two years of classwork have been improved by bringing faculty members together to integrate the content so that learning progresses from course to course.

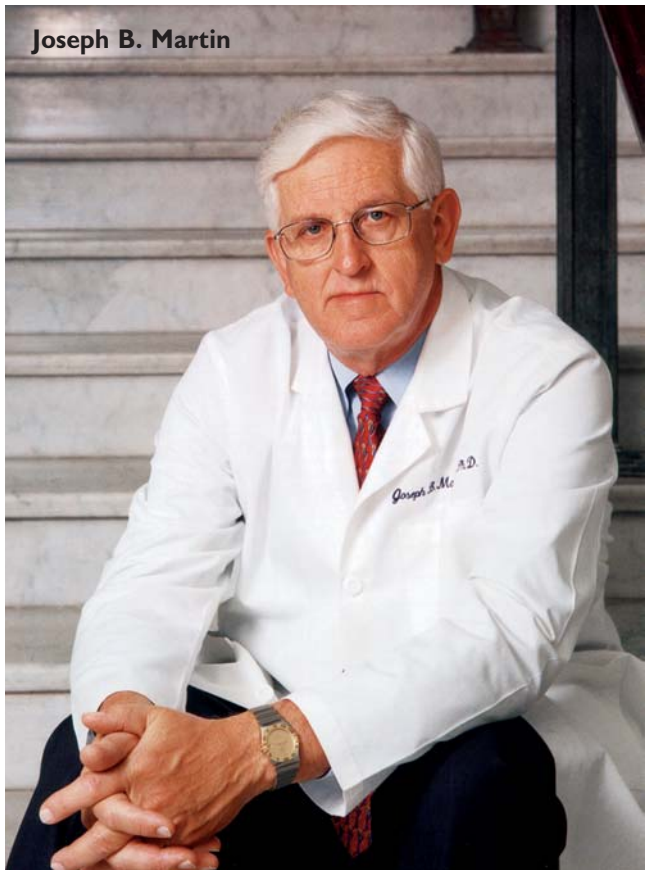
Effecting this kind of change is especially difficult because HMS depends on the hospitals for most of its teaching faculty: their appointments are contingent on a minimum of 50 hours of teaching annually. Early in his tenure, when some of the hospitals were under acute financial pressure, Martin arranged to boost payments to the hospital-based faculty members who hold endowed chairs, assuring that education would remain a priority. In the current environment, he disclosed, HMS and the hospitals have jointly agreed to boost their spending on hourly stipends for other clinical faculty members who agree to teach more than the annual minimum. The new funds—a 40 percent increase, bringing such spending to $15 million annually—help encourage the hospital-based faculty to balance patient care and teaching.

This small example points to a much larger theme in Martin's deanship. Relationships with the hospitals, he said, "now are characterized by thoughtful, open, transparent discussions around the academic mission." That's a radical change from the situation in the mid 1990s, when Boston's major teaching hospitals formed partnerships, consolidated staffs, and courted one another's star doctors in an aggressive effort to bring in patient and research revenue.

"I thought healing of those relationships for mutual advantage was the most important thing I could do" at the beginning of his tenure, Martin said. Having been based at Massachusetts General Hospital (MGH) earlier in his career (Martin is Walker professor of neurobiology and clinical neuroscience), he brought affiliate and HMS perspectives together at a time of "quite ugly competitions." He was particularly disturbed, for instance, by the financially stronger institutions' "poaching" of staff from weaker hospitals, a practice that "needed to be refereed." It now is, by a council of academic deans who agreed to standards for such lateral recruitment across their institutions, review them, and discourage "community-degrading" hirings that are not legitimate promotions, Martin said.

More broadly, as dean, he began monthly, individual meetings with the hospital CEOs, in their offices or his own. Given the distance across Boston to MGH, Martin holds office hours there at least eight days a year. From such contacts have come cooperative searches for new faculty, joint research strategies, and, in spirit at least, "shared governance." There are now cooperative centers, involving hundreds of researchers at HMS and the affiliates, that address cancer, neurological disorders and injuries, and other critical biomedical problems. Martin also became personally involved (with the institutions' trustees) in searches for new leaders of Dana-Farber Cancer Institute, Beth Israel Deaconess Medical Center, and Children's Hospital.

Education is "always in jeopardy of being reduced in its importance" relative to the enormous research and clinical enterprises.


Joseph B. Martin

The strength of those ties will likely be tested anew. Three years of level research funding from the National Institutes of Health Research, after an extended period of vigorous growth, will "create new tensions," Martin said. Each hospital plans further research expansion, and tight resources will heighten friction about retaining current faculty and researchers and recruiting new ones. In such circumstances, education is "always in jeopardy of being reduced in its importance" relative to the enormous research and clinical enterprises.

Fueled (until recently) by fundamental discoveries and the abundance of funds, the research itself is burgeoning, in fields from genomics and proteomics to clinical investigations across the spectrum of ill-

Photograph by Graham Ramsey/Harvard Medical School

Exemplary Contributors

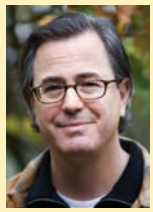
With great pleasure, the editors recognize four contributors to *Harvard Magazine* during 2006, awarding each $1,000 for their distinguished service to readers.

Adam Kirsch

The McCord Writing Prize, named for David T.W. McCord '21, A.M. '22, L.H.D. '56, recalls the lively prose and verse he wrote at this magazine and at the Harvard College Fund. This year's prize honors, for the second time, contributing editor Adam Kirsch '97, for "Rereading the Renaissance" (March-April) and the November-December cover story, a profile and assessment of poet Seamus Heaney. Kirsch's wide reading and wonderful writing make literature fresh and important.

Debra Bradley Ruder

The Smith-Weld Prize—in the memories of A. Calvert Smith '14, formerly secretary to Harvard's governning boards and executive assistant to President James Bryant Conant, and Philip S. Weld '36, former president of the magazine—celebrates thought-provoking journalism about the University. Debra Bradley Ruder's feature, "Life Lessons" (January-February), presented compelling personal stories about medical students and their gravely ill patients, and in a September-October news account, she provided a lucid report on Harvard Medical School's new curriculum.



Stuart Bradford

Illustrator Stuart Bradford insightfully interpreted the January-February cover story on how political opinions are formed and change, among his other resonant work during the year.

Jim Harrison

Photographer Jim Harrison, long a contributing editor, enlivened numerous articles, in assignments ranging from an illustrated feature on the reinstalled Collection of Historical Scientific Instruments (March-April) to portraits of departing President Lawrence H. Summers (September-October cover article). It is a pleasure to acknowledge his invaluable work again. Characteristically, Harrison continues to reinvent himself, practicing photography in a new medium in this issue (see page 51).

nesses. In addition to creating a large systems biology department (see "Seeing Biological Systems Whole," March-April 2005, page 67), the medical school has launched a raft of new programs to train future leaders in academic and institutional medicine, including: Ph.D. programs in systems biology and in chemical biology with the Faculty of Arts and Sciences (FAS); a joint M.D.-M.B.A. program with Harvard Business School; and a social-sciences track within the existing medical Ph.D. course of study.

Scanning the array of research initiatives, Martin said, "The startling thing about biology, about how cells work and go wrong, is how complex the solutions will turn out to be." He noted that the Human Genome Project, assumed to get at the medical holy grail by identifying each human gene, had been completed before RNA interference was even discovered, in 1998; this fundamental mechanism, recognized last October with a Nobel Prize, has "completely transformed how we think about genetics," suggesting that the means of switching genes on and off are even more important than the genes themselves. That implies whole new layers of research, investigations of abnormalities, searches for sites for medical intervention, and design and trial of therapies. For all the translation of knowledge into potential drugs, he said, "Basic, fundamental research is where most of the rewards are going to come from." Given HMS's prowess as a research institution, "We ought to protect that in every way possible," from junior faculty searches through support of graduate students to appointment of the scientists who lead the core departments.

To sustain such research at Harvard, Martin said, "science planning in a way that's never been done before is really critical," especially during the next 10 years—a priority also identified by President Derek Bok and FAS dean Jeremy R. Knowles (see "Interim Agendas," November-December 2006, page 65). New techniques, equipment, and lines of inquiry are all advancing; with plans proceeding to build a science complex in Allston, "new spaces in which to work on integrative science" are near at hand. But the University, Martin cautioned, has much work to do "to discern the ways" to organize itself for such research effectively and efficiently. "Allston ought to *be* that"—the physical and intellectual working out of ways as yet unperfected for collaborative science, productively disrupting current norms without violating useful disciplines and controls.

Alongside that basic research, Harvard also needs to envision a whole new way of approaching clinical investigation, in order to translate discoveries into medical applications. Acute-care hospitals do the work now, expensively, Martin said. In an era of genomic and proteomic science, when physicians may acquire detailed knowledge of an individual's genetics and hundreds of possible molecular targets for, say, a cancer treatment, a whole new paradigm for evaluation and testing may be required. Moving to create such a facility and processes, in Allston or alongside HMS (if the Harvard School of Public Health relocates to Allston), must be a priority for the next decade, he believes.

Whether the public keeps faith with biomedical progress, of course, depends on its trust in scientists. Martin has worked extensively to maintain standards that minimize financial conflicts of interest and promote full disclosure of funding sources, so that researchers are "above reproach." That work was not universally popular at first, but has since been widely emulated within academic medicine (see "Controlling Conflicts of Interest," September-October 2004, page

Photographs courtesy of the subjects

76). Last autumn, he again reminded HMS and affiliated researchers of their obligation to fully disclose all financial relationships when publishing in the leading medical journals; recent violations of that policy had prompted wide news coverage and professional criticism.

Waving off objections to HMS's strict policies, Martin said there was no evidence that they have discouraged research or the commercialization of promising discoveries. To the contrary, a paper he and a coauthor published in December explores different obstacles to productivity, at least in neurological drug discovery; they identify organizational barriers, including the ways in which intellectual property (read: marketable knowledge) is sequestered, rather than pushed ahead for patient use. Martin expects to explore this topic further during his forthcoming sabbatical year.

Leading the medical school—with its half-billion-dollar budget, its 1,500 students, and (counting the affiliated institutions) several thousand interns, residents, and postdocs, and its 7,000-plus faculty members—is perhaps the most complex decanal position at Harvard. Martin said "generosity without a grudge" had proved an effective style of managing and making decisions. His successor will need that and more. As for himself, Martin said, after a fulfilling decade at HMS's helm (and prior executive leadership at the University of California, San Francisco), he looks forward to resuming his professorial duties: "I don't plan to run anything ever again."

Faculty, Family, Diversity

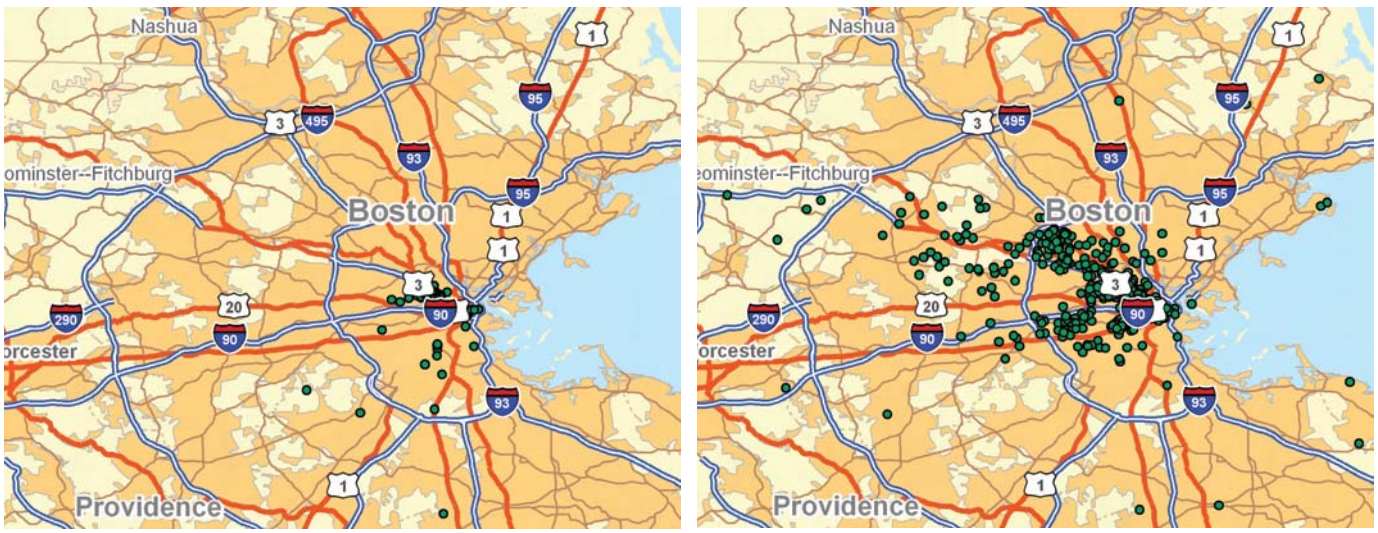
In her first annual report, the Faculty of Arts and Sciences' (FAS) senior advisor to the dean on diversity issues has highlighted recent results in recruiting female faculty members, and some of the real obstacles to effecting change in the composition of the professoriate (see the text at www.fas.harvard.edu/~diverse/reports.html).

Dillon professor of international affairs Lisa Martin reports that the proportion of tenure offers made to women rose to nearly 30 percent during the past two academic years. (The sharp decline from 36 percent to about one-third that level from 2000-2001 through 2003-2004 had prompted wide concern and discussion within the faculty and between FAS and the central administration.) Since 2003-2004, however, the percentage of women *accepting* such offers from Harvard has trailed the proportion of offers made, reversing prior experience. And among women offered tenure-track positions, the rate of acceptance collapsed in the 2005-2006 academic year: 71 percent of men offered tenure-track positions accepted, but just 47 percent of women did so, Martin wrote in a subsequent e-mail. She will monitor the results to determine whether the past year was an anomaly or the beginning of a trend. Candidates who rejected Harvard's offer cited perceived better chances of attaining tenure elsewhere, and the problems of relocating as a member of a dual-career couple.

Martin devotes considerable attention to search processes (as a key to ensuring the effectiveness of faculty recruiting), and to mentoring young faculty members once they arrive. Detailed manuals on junior and senior searches are now available, as are new protocols for assessing the pool of candidates, learning about the performance of peer departments, and keeping adequate records. Twenty-five senior women faculty members are now serving as formal mentors for small groups of junior women.

But all these efforts run into a complicating fact of faculty life. Maps prepared for Martin's report show that the costly Boston-Cambridge housing market and dispersed employers in dual-career families have caused the faculty to spread far afield geographically. (These patterns may be understated, because some of the addresses used in the mapping appear to be campus office locations.) "Harvard is no longer a residential college, from the faculty perspective," Martin observes, yet

Farther from home: Faculty residences in and around Greater Boston and its suburbs in 1905 (left) and 2006 show much longer commutes, leading to far greater challenges in balancing family and academic obligations.



Maps courtesy of Wendy Guan/GIS Research Services

it "continues to operate using the same norms." Thus, faculty members who face hour commutes (not unusual) to get home before caregivers end their work day are disadvantaged by a schedule with FAS meetings that run until 5:30, departmental meetings and seminars that run even later, and frequent dinners and evening hours. These conflicts fall especially heavily on untenured faculty with young children, on women, and on single parents, Martin notes. Beyond "providing better access to childcare, leave, and tenure-clock policies," she says, Harvard and FAS will have to "reconsider the way that we do business" if faculty members are to have any opportunity to balance work and family-life obligations in an era when professors can no longer depend on a stay-at-home spouse.

These issues are being raised elsewhere as well. Stanford's Clayman Institute for Gender Research (www.stanford.edu/group/gender) has just launched a "dual-career academic couples" study, focusing on 30,000 faculty members at leading research universities; the study design notes that an extraordinary number of women scientists and mathematicians are married to men in their own fields, raising difficult problems of mobility and advancement.

The 2006 report of Johns Hopkins University's Committee on the Status of Women, issued this fall, focuses on "long-standing traditions and attitudes in the culture" that have had "pernicious effects on career success and satisfaction" among women. An "inflated emphasis on the work environment, to the exclusion of all else," is perceived internally as distinguishing that university "as a male-dominated environment, non-supportive to women." The report advocates 50 percent representation of women in senior faculty and administrative leadership positions by the year 2020, a goal endorsed, at least as an aspiration, by the provost, who suggests that attaining it will be more diffi-

Part History, Part Literature

In 1906, Professor Barrett Wendell '77 created a program in history and literature for Harvard undergraduates. In a later speech to the American Academy of Arts and Letters, he explained his creation as a cure for the "confused times" in which he and his students lived. Because everyone was "increasingly apt to think of everything as distinct from everything else," Wendell proposed a course of study in which everything would be related.

That program became Harvard's first concentration. And during its 100 years, History and Literature has been shrinking not in the number of concentrators (now around 162) or fields (including six national, eight regional, and three chronological), but the committee's sobriquet—what began as "History & Literature" became "History & Lit" and has been trimmed most recently to "Hist & Lit."

A century later, Hist & Lit is still honors-only: every one of its concentrators completes a tutorial every year, each of them still endures an oral exam before graduating, and they all write a thesis. They may communicate the name of their concentration with fewer syllables, but today's students are as elite as the alumni who came before them.

On Saturday, October 14, 2006, about 70 current and former students converged to celebrate this distinguished but still living legacy in a program called *Beyond the Gates*. Professor of history and chair of history and literature Jill Lepore opened the centennial celebration a few minutes after nine in the morning, too early for most of the students who would later slip into Emerson Hall and take seats in the back. Praising Barrett Wendell and his "daily themes" assignments, Lepore argued that the committee's pedagogy has always included close attention to student writing. The leitmotif of the day was learning how to live "beyond the gates," but each of the three panels had its own theme—"Story," "Justice," and "History."

Talking narrative and stories were writers Clara Bingham '85 and Peter Blake '91. Bingham, a journalist who is the author of *Class Action: The Landmark Case that Changed Sexual Harassment Law*, and Blake, a screenwriter for the television shows *House, M.D.* and *The Practice*, both said their writing was made possible by History & Literature.

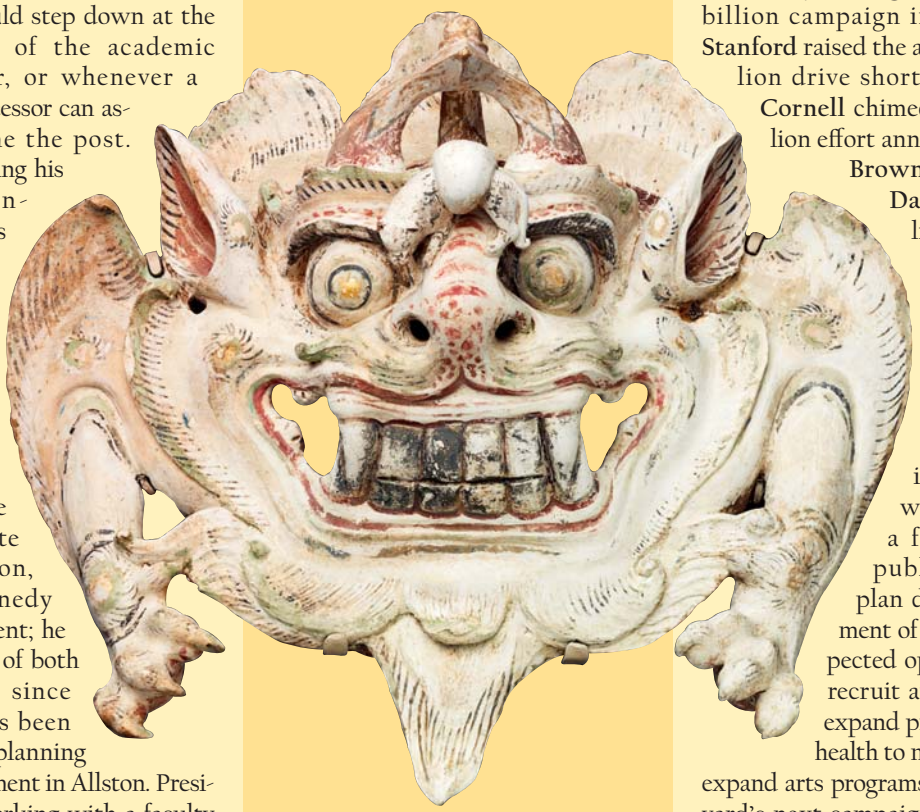
Justice panelist Frank Rich '71, the *New York Times* drama critic turned observer of the American political scene, said "My view of the world came to light in Hist & Lit." Two younger panelists, Rosa Brooks '91, a *Los Angeles Times* columnist and a professor of law at Georgetown University, and Adam Goodheart '92, the essayist who is director of the C.V. Starr Center for the Study of the American Experience at Washington College, both credited the program with their deepest beliefs: for Brooks, that "narrative exists only in retrospect"; for Goodheart, that "we are all becoming history all the time."

Alumni of the concentration as well as undergraduates used the question-and-answer sessions to remember their favorite tutors, to reflect on the rigor of the committee's course of study, and to acknowledge how Hist & Lit had changed their lives: a playwright said his works are historical because of the time he spent in the program; a writer wondered aloud whether adapting scholarship for a popular audience compromises it; everyone seemed to be discussing the relevance of cultural studies and narrative history.

In the last round of speeches, on history, Adam Hochschild '63, the author most recently of *Bury the Chains: Prophets and Rebels in the Fight to Free an Empire's Slaves*, and Nicholas Lemann '76, dean of the Columbia University Graduate School of Journalism and author of the recent *Redemption: The Last Battle of the Civil War*, both spoke about the rise of nonprofessional journalists, such as bloggers. And panelist Edward Widmer '84, Ph.D. '93, a former speechwriter for President Bill Clinton who now directs the John Carter Brown Library at Brown University, captured the room when he read aloud a letter from Hist & Lit alumnus and late-night television host Conan O'Brien '85, who declared, "For anyone with a fear of commitment, this was the department."

—CASEY N. CEP

Brevia



ASIAN ACCESSIONS: A major collection that includes three Japanese Buddhist sculptures and more than 300 early Chinese ceramics has been given to the permanent collection of the Sackler Museum's department of Asian art by Walter C. Sedgwick '69 and the Walter C. Sedgwick Foundation. Shown here is an eighth-century Tang dynasty earthenware monster mask.

Design Departure

Alan A. Altshuler, dean of the Harvard Graduate School of Design since February 2005 (and acting dean for several months before that), announced on October 23 that he would step down at the end of the academic year, or whenever a successor can assume the post. During his deanship, Altshuler has boosted financial aid and increased junior faculty salaries. An urban planner, he previously founded the Taubman Center for State and Local Government and the Rappaport Institute for Greater Boston, both at the Kennedy School of Government; he has been a member of both schools' faculties since 1988. Altshuler has been deeply involved in planning for campus development in Allston. President Derek Bok, working with a faculty advisory group, will identify decanal candidates to be considered by the next Harvard president. Searches are also under way for candidates for the Faculty of Arts and Sciences and Harvard Medical School deanships.

KRIS SNIBBE/HARVARD NEWS OFFICE

Alan A. Altshuler

University Professor

Henry Louis Gates Jr., chair of the department of African and African American studies from 1991 to 2006, is now Fletcher University Professor. In announcing the appointment on October 23, President Derek Bok cited Gates for taking "a field of study that, years ago, was floundering at Harvard and transform[ing] it into the leading department of its kind." A literary scholar, Gates has been a MacArthur Fellow and has presented the National Endowment for the Humanities' Jefferson Lecture; he recently coedited an annotated version of *Uncle Tom's Cabin*. Gates succeeds **Cornel West**, the first holder of the chair, who departed Harvard for Princeton in 2002.

HARVARD NEWS OFFICE

Henry Louis Gates Jr.

Capital Campaigners

Universities' rush for resources—for science, undergraduate education, international work, and financial aid—has intensified. In addition to **Yale's** $3-billion capital campaign and **Columbia's** $4-billion fund drive (see Brevia, November-December 2006, page 73), the **University of Virginia** announced a $3-billion campaign in late September, **Stanford** raised the ante with a $4.3-billion drive shortly thereafter, and **Cornell** chimed in with a $4-billion effort announced October 26. **Brown** ($1.4 billion) and **Dartmouth** ($1.3 billion) are in the middle of their own fundraisings, and the **University of Pennsylvania** is expected to launch its own effort publicly later in the year. **Duke**, without undertaking a formal campaign, published a strategic plan directing the investment of $1.3 billion atop expected operating budgets to recruit and support faculty, expand programs from global health to medical imaging, and expand arts programs and facilities. Harvard's next campaign will no doubt be prominent on its next president's agenda.

Public-Affairs Post

Vice president for government, community, and public affairs **Alan J. Stone**, who came to Harvard from Columbia in 2001, announced on November 8 that he would step down at the end of the academic year. Locally, he directed the University's relations with Cambridge and Boston during a period of extensive construction of University housing and scientific buildings at the edge of the existing campus. Meanwhile, work advanced toward the submittal to Boston of the master plan for Allston development and construction of the first science building there. President

JUSTIN IDE/HARVARD NEWS OFFICE

Alan J. Stone

Photograph by Photographic Services © President and Fellows of Harvard College.

Derek Bok cited Stone's "professionalism, collegiality, and care" in carrying out a broad portfolio of responsibilities.

Nota Bene

HEDGE-FUND FIXTURES. Eliot University Professor **Lawrence H. Summers**, president of Harvard from 2001 to 2006, has joined D.E. Shaw & Co., a hedge-fund manager, as a part-time managing director, working on "strategic initiatives" and "high-level portfolio management activities." At the same time, another former Secretary of the Treasury, John W. Snow, became chairman of Cerberus Capital Management, also a hedge-fund company. Both bring to their new positions broad perspective on economic issues and on government at a time when more oversight of hedge funds is under discussion in Washington.

EXEMPLARY ETHICIST. Whitehead professor of political philosophy **Dennis F. Thompson**, founding director of the University-wide center for academic work on ethics, will step down at the end of the academic year, concluding two decades of service. The Safra Foundation Center for Ethics (www.ethics.harvard.edu) now supports graduate-student and faculty fellowships, curriculum development, and public programs.

CONTEMPORARY CURATOR. With the arrival of **Helen Molesworth**, the Harvard University Art Museums gained their first full-time curator of contemporary art since the department of modern and contemporary art was established in 1997. She had been chief curator of exhibitions at the Wexner Center for the Arts in Columbus, Ohio.

HARVARD UNIVERSITY ART MUSEUMS

Helen Molesworth

POST-HIID DEMOTION. Economist **Andrei Shleifer**, whose advisory work on restructuring the Russian economy for the Harvard Institute for International Development resulted in a personal $2-million settlement with the federal government and a $26.5-million University settlement [see "Russia Case (and Dust) Settle," November-December 2005, page 59], has lost his endowed chair. The former Jones professor of economics is now professor of economics. Interim dean of the Faculty of Arts and Sciences Jeremy R. Knowles, who had appointed Shleifer to the named chair, took the disciplinary action following an investigation by the faculty's Committee on Professional Conduct. As is the norm in such cases, no further information was released.

MISCELLANY. A new Harvard China Fund will be a source of venture capital for academic initiatives involving University people studying China, working there, or engaging colleagues from that country. It will be overseen by Geisinger professor of history **William C. Kirby**, director of the Fairbank Center for East Asian Research....**Kevin Starr**, Ph.D. '69, historian of California, and classicist **Mary Lefkowitz**, Ph.D. '61, BF '73, of Massachusetts, were honored with the National Humanities Medal in a White House ceremony on November 9. **Erich Kunzel Jr.**, G '58, of the Cincinnati Pops Orchestra, was named a National Arts Medalist....The Library of Congress has named **John Hope Franklin**, Ph.D. '41, LL.D. '81, an emeritus professor of history at Duke, and **Ying-shih Yu**, Ph.D. '62, an emeritus professor of history and Chinese studies at Princeton, the cowinners of the $1-million Kluge Prize for the Study of Humanity.... Gurney professor of history **Roy P. Mottahedeh** has been appointed director of the new University-wide Islamic studies program....The National Book Foundation conferred a lifetime achievement award on poet **Adrienne Rich** '51, Litt.D. '90, in November. It also honored **M.T. Anderson** '91 with the National Book Award for young people's literature for *The Astonishing Life of Octavian Nothing, Traitor to the Nation, Volume One: The Pox Party*, and, posthumously, **Barbara (Zimmerman) Epstein** '49. Epstein shared the foundation's Literarian Award for outstanding service to the American literary community with her longtime collaborator, **Robert Silvers**, with whom she co-founded and edited the *New York Review of Books*.

IRENE FERTIK

Kevin Starr

DUKE UNIVERSITY PHOTOGRAPHY

John Hope Franklin

TAYLOR PHOTO

Ying-shih Yu

RADCLIFFE GYM REBORN: Continuing the physical transformation of the Radcliffe Institute, the former gymnasium has been totally renovated to create a central gathering place where the institute's fellows and others can conduct seminars, make and hear presentations, confer on their research, and attend speeches by visitors. The new facility opened last June. With Harvard College and Graduate School of Arts and Sciences admissions relocated from Byerly Hall (to Agassiz House, 86 Brattle Street, and Holyoke Center), the next step will be creating offices for all the institute fellows, who are now located away from the campus; that work is scheduled to be completed by the autumn of 2008.

Photograph by Richard Mandelkorn

cult in the tenured faculty ranks.

More broadly, the American Association of University Professors (www.aaup.org) examines 1,445 universities and colleges in a new report, "Faculty Gender Equity Indicators 2006." It reveals disproportionately lower representation of women in the tenured ranks at research universities compared to other institutions, and equivalent disparities in the full- versus part-time ranks and in compensation (the latter in part representing differences in pay scale among professional and liberal-arts schools).

Finally, the most difficult challenges in evolving a diverse faculty remain in the natural sciences, where Martin's data indicate that just 11 percent of tenured positions are held by minorities, and 8 percent by women. The "pipeline" issues are most pronounced in these disciplines, as underrepresented students who enter college interested in science wash out of the field at a disproportionate rate. Molecular geneticist Wendy E. Raymond, Ph.D. '90, associate professor of biology at Williams, and Robert A. Lue, director of life sciences education in Harvard College, recently reported on ways to sustain such students' commitment to science by using practices proven "effective at minority-serving institutions, but...successfully implemented at [only] a handful of traditionally white institutions." Their work for the Diversity in the Sciences collaborative (www.williams.edu/biology/-divsciences, supported by the National Institutes of Health, Howard Hughes Medical Institute, Harvard, University of Louisiana at Monroe, and University of Washington) suggests the importance of introducing entering freshmen to college science even before they enroll, immediate and continued mentoring by faculty members and student peers, early involvement in research, and mandated peer study groups.

In this, Raymond and Lue echo Martin and other scholars who have probed the issues of academic and intellectual diversity in depth: they all find close, committed investment in students, or in junior scholars at the outset of their academic careers, fundamental to further development.

Crimson in Congress

In the aftermath of last November's elections for the 110th Congress, one Harvard alumnus stood very much alone. Representative Thomas Petri '62, LL.B. '65, Republican of Wisconsin, is the sole remaining member of his party in the House to have graduated from, or matriculated in a degree program at, the University.

TONY FREUND

Thomas Petri

Overall, Harvard's Capitol Hill alumni (as defined above, for this exercise) will drop from the contingent of 41 who sat in the 109th Congress to a group of 35 in January. That total includes 29 Democrats, equal to the tally in the last session, but only six Republicans (down five). The University's two new faces are both Democratic House members: John Sarbanes, J.D. '88, of Maryland, and Joseph Sestak, M.P.A. '80, K '82, Ph.D. '84, of Pennsylvania. (Sarbanes is a son of Maryland's senior U.S. senator, Paul Sarbanes, J.D. '60, who is retiring after five terms.) The Democrats' total will rise by one if Representative William Jefferson, J.D. '72, of Louisiana, the subject of an FBI bribery probe, wins a run-off election December 9.

COURTESY OF SHARON L. NATHANSON

John Sarbanes

The thinning of Harvard's congressional Republicans was not due entirely to the voters. Senator William Frist, M.D. '78, of Tennessee, stepped down after serving two terms. Representative Christopher Cox, M.B.A. '75, J.D. '77, of California, was named chairman of the Securities and Exchange Commission in 2005 by a Business School classmate, President Bush. And Katherine Harris, M.P.A. '97, of Florida, ran unsuccessfully for the Senate. But voters in Connecticut did reject Representatives Nancy Johnson '57, after 12 terms, and Robert Simmons, G '73, M.P.A. '79, who lost by 91 votes after three terms.

COURTESY OF ZACH STEACY

Joseph Sestak

OFFICE OF CONGRESSWOMAN NANCY L. JOHNSON

Nancy Johnson

On the Democratic side, Representative John Barrow, J.D. '79, of Georgia faced a hard race, but held onto his seat by 864 votes. The Democratic caucus will welcome Vermont's new Senate Independent, Bernard Sanders, IOP '89, who succeeded retiring Independent James Jeffords, LL.B. '62. Sanders is one of several legislators who have taught at Harvard or participated in Harvard programs. Another is Representative Michael McCaul, SEF '02, of Texas, who will help Thomas Petri hold up the Republican side.

OFFICE OF CONGRESSMAN JOHN BARROW

John Barrow

The line-up at press time (asterisks mark newcomers):

Senate Republicans: Michael D. Crapo, J.D. '77 (Id.); Elizabeth Dole, M.A. '60, J.D. '65 (N.C.); Ted Stevens, LL.B. '50 (Alaska); John E. Sununu, M.B.A. '91 (N.H.); David Vitter '83 (La.).

Senate Democrats: Jeff Bingaman '65 (N.M.); Russ Feingold, J.D. '79 (Wisc.); Edward M. Kennedy '54 (Mass.); Herbert H. Kohl, M.B.A. '58 (Wisc.); Carl Levin, LL.B. '59 (Mich.); Barack Obama, J.D. '91 (Ill.); John F. (Jack) Reed, M.P.P. '73, J.D. '82 (R.I.); John D. Rockefeller IV '58 (W.V.); Charles E. Schumer '71, J.D. '74 (N.Y.).

House Republican: Thomas E. Petri '62, LL.B. '65 (Wisc.).

House Democrats: Thomas H. Allen, J.D. '74 (Maine); John Barrow, J.D. '79 (Ga.); James H. Cooper, J.D. '80 (Tenn.); Artur Davis '90, J.D. '93 (Ala.); Chet Edwards, M.B.A. '81 (Tex.); Barney Frank '61, G '62-'68, J.D. '77 (Mass.); Jane Harman, J.D. '69 (Calif.); Brian Higgins, M.P.A. '96 (N.Y.); Ron Kind '85 (Wisc.); James R. Langevin, M.P.A. '94 (R.I.); Sander M. Levin, LL.B. '57 (Mich.); Stephen F. Lynch, M.P.A. '99 (Mass.); James D. Matheson '82 (Utah); *John P. Sarbanes, J.D. '88 (Md.); Adam B. Schiff, J.D. '85 (Calif.); Robert C. Scott '69 (Va.); *Joseph A. Sestak Jr., M.P.A. '80, K '82, Ph.D. '84 (Pa.); Bradley J. Sherman, J.D. '79 (Calif.); Christopher Van Hollen Jr., M.P.P. '85 (Md.); David Wu, M '81 (Ore.).

THE UNDERGRADUATE

A Crutch or an Anchor?

by EMMA LIND '09

STUMBLING ALONG Mount Auburn Street on my way to my Social Studies 10 lecture, I barely manage to juggle *Wealth of Nations*, this morning's *Crimson*, and the peanut butter sandwich I am carrying in my mouth. And then I feel it, in the depths of my book bag, just out of reach: the unmistakable vibration of my cell phone.

At first I ignore it, but it keeps ringing as I push my way up Plympton Street. In a few seconds, I feel the telltale single vibration alerting me to a text message. I assume it's one of my friends, asking me to pick up something on the way to lecture, so I stop on the steps of the Crimson building, letting my books fall to the ground, and rummage through my bag until I find my phone. Sliding it open, I see that the text message is from my mother.

"Hi." One word that really doesn't seem to warrant the fact that I just spilled my life all over a Cambridge sidewalk.

According to Mapquest.com, my home in Illinois is 1,011.5 miles away from the Crimson building. But thanks to the wonders of modern technology—or rather, our parents' delayed but ultimately successful mastery of it—we Harvard students are rarely more than a few clicks away from our families' fingertips.

The ease and skyrocketing popularity of communication via instant message, text message, and thefacebook.com has largely changed long-distance communication from "Emma, the cat choked on a chicken bone and died" to "Emma, I saw what's-her-name with what's-her-face at the grocery store today and they said hi. Do you want me to send you more Q-Tips?" And if the ability to stay in constant contact with friends from home makes the transition to college less abrupt, the simultaneous virtual proximity to parents and guardians who are hundreds or thousands of miles away can skew the dynamic of parent-child separation.

College, especially if it involves a long-distance move, can mean a completely unfamiliar way of life for students. But in many cases, including my own, the change seems to scare the parents more than it does the child. Doing laundry, eating healthily, and making time to study are all valid concerns for wide-eyed freshmen, but often even more so for their parents. During my first month at college, I repeatedly reassured my panicking mother that I was able to do my laundry, despite the fact that she had forgotten to get me rolls of quarters before I left Illinois. While I gleefully swiped Crimson Cash into the laundry machines and turned all of my socks a pleasant shade of baby blue, my mother suggested getting a laundry service. I can only guess that she had visions of my traipsing around campus in pajamas for want of clean clothes.

Illustrations by Karen Fredericks

Of course, this scenario was presumably as common 20 years ago as it is today. What's different is the way that instant communications bridge the geographical gap between students' lives at home and their lives at school. Lucy Caldwell, a sophomore in Adams House, notes that when her mother was a student at the College in the 1980s, she spoke to her parents on the phone for 30 minutes a week. She talked to her mother for the first 20; when her father got on the line for the last 10, he reminded her not to repeat anything she had already told her mother. That way, she didn't waste precious minutes telling her dad things that had already been relayed to her mom.

A similar strategy guided my communications with my parents when I went to summer camp, where we were allowed 15 minutes of phone time a week. Chatting was impossible, and so our conversations became chances to share crucial information only: a far cry from the long discussions about politics and school I had over family dinners at home.

Compared to her mother's experience communicating with her own parents, Caldwell's mother-daughter relationship is intimate, despite the distance between Cambridge and her home in Arizona. Caldwell attributes this largely to technology.

"My mom is literally the first number in my cell phone," she says. "She knows everything that is happening in my life, and we probably talk five or six times a day." Caldwell says she calls her mother for everything from asking advice about a term paper to bemoaning a newly broken nail. She admits that having her mother

constantly at her fingertips is probably a crutch of sorts, but is relatively unconcerned about what it may be doing to her, besides delaying an eventually inevitable separation. What she notices more is her mother's dependence on hearing from her: "Most mornings we talk on my way to class, but if she hasn't heard from me by about 11 A.M. her time, then she calls me to see if everything's okay."

The question that arises is whether instant communication has a stabilizing or debilitating effect on undergrads away from home for the first time—and on the parents who may have trouble letting them go. Is instant communication a way of making sure students are adjusting to life at Harvard, or a way for parents to creep further into their children's lives just when they should be easing back?

Dean of freshmen Thomas A. Dingman acknowledges that cell phones and e-mail have had a big impact on the lives of Harvard students, who are rarely out of close contact with the folks back at the homestead. "Read the headlines," he says. "Parents are like helicopters, hovering over their children, leaving Harvard wondering how to respond." Often, he says, he and a student meet to decide on the best path to resolve a certain issue, and then, even before the student leaves the building, he or she is on the phone with parents.

"Parents are like helicopters, hovering over their children."

This may seem counter-intuitive. After all, in surveys of Harvard freshmen, students indicate that they value the advice of their peers very highly. The same holds for me. But in my experience, I have found that Harvard students are more willing to dispense their own unsolicited opinions than they are to take the time to work through a difficult situation with a friend. Parents, on the other hand, have a more vested interest in a child's well-being. Often, it is easier to get in touch with a parent or guardian than it is to reach a roommate busy with an Expos paper, and this can exacerbate students' long-distance dependence on their parents. Dingman sees students' tendency to resort to their families for help making the "tough calls" as an impediment to the naturally occurring process of learning through trial and error.

Of course, not every parental relationship runs the fine line between mothering and smothering. For some families, a child's independence is a milestone reached long before the son or daughter trots off to college. Admittedly, my family situation is a relative incubator for over-attentiveness: the only child of two retired parents, I am a prime candidate for micromanagement.

Still, I am reluctant to chalk up my closeness to my parents entirely to my specific situation. After all, I know international students who talk to their parents daily, while friends of mine who live mere seconds off campus go weeks without exchanging words with home. Similarly, Caldwell is one of three kids, and I know single children who rarely chat with their families. Obviously, each student's relationship with his or her parents reflects more subtle family dynamics than what is immediately apparent. But what is remarkable is how technology has made distance, which was once a major barrier to communication between students and families, something peripheral if not entirely irrelevant when considering how close undergraduates remain to their parents once they go to school.

My relationship with my parents has grown during college from one of primarily physical dependence to one of long-distance emotional support. Now that I am feeding and clothing myself, and even making my own money without the constant presence of my family, I have come to appreciate their role in the first 18 years of my life much more. Because I am fortunate enough to have my family paying my tuition, I tend to defer to them when I make a decision that directly affects my college career. More important, though, are the times when I turn to my parents for advice from outside the Harvard bubble, such as whether or not to join a social club, or sell my soul to the world of consulting, or pursue my passion for writing. Being able to reach out and touch someone in Illinois as I'm walking across Sever Quad is less of a crutch, and more of an anchor. And I'm starting to find my mother's attempts at newfangled communication less intrusive and more endearing.

Last year, the away message on my AOL Instant Messenger read, "Lamont for the night!" I was referring to the library, but my mother had a different idea. When I returned to the computer, I had a series of messages reading, "Who is Lamont?!??!!" and "Why aren't you writing back to me??!!"

Instead of being irritated, I now take pleasure in my mom's loving attempt to mother me from afar, when in reality, I'm doing okay on my own. She's coached me through 19 years of growing up. The least I can do is teach her a little about chatting on-line.

Berta Greenwald Ledecky Undergraduate Fellow Emma M. Lind '09 is a social studies concentrator who lives in Winthrop House. Only once has she ever worn pajamas in lieu of clean clothing.

SPORTS

Who Let the Dogs Out?

The Yale bulldog, muzzled by Harvard for five straight years, broke loose at the Stadium on November 18 and went on a tear. Closing out an Ivy League season made memorable by the exploits of Crimson running back Clifton Dawson, Yale's 34-13 victory gave the Eli the co-championship of the league (shared with Princeton) and consigned Harvard to third place in the final standings. The best efforts of Dawson, who had broken a 35-year-old Ivy rushing record a week earlier, were unavailing against Yale's stoked-up defense. The Blue defenders held the fleet senior tailback to a single touchdown and 60 yards rushing in 24 attempts, an average of 2.5 yards per carry. In his three previous outings against Yale, Dawson had rushed for 184, 120, and 128 yards, averaging close to five yards a carry.

All told, Dawson shattered 10 Ivy records this fall, and broke every single-season and career rushing record that Harvard keeps (opposite). Crimson football followers can take pride in his accomplishments, and in the less-publicized fact that over a four-year span of 40 games, the seniors on this fall's squad enjoyed a success rate higher than that of any Ivy or Patriot League team: a won-lost percentage of .775.

With the Ivy League's highest-scoring offense as well as its top-ranked defense, the 2006 team compiled an overall record of 7-3, finishing 4-3 in league play. Unhappily, its three losses—and its only offensive letdowns—came in critical Ivy contests against Princeton, Penn, and Yale.

Harvard started the season in fine style, with wins over Holy Cross, Brown, Lehigh, Cornell, and Lafayette. Dawson scored early and often, recording three touchdowns in each of the first four games. A bevy of skilled receivers bolstered the passing attack, and the team's defensive prowess enabled Harvard to score 31 unanswered points against Holy Cross, 28 against Lehigh, 26 against Cornell, and 24 against Lafayette. The defense's front four, led by all-Ivy tackle Michael Berg '07, was the best in the nation at stopping the run. At the midpoint of the season, Harvard's chances of losing three of its five remaining games would have seemed remote.

But that's what happened. With first place in the league standings at stake, Harvard headed to Princeton Stadium and lost to the unbeaten Tigers, 31-28. Dawson once again scored three times, breaking the Ivy career record for rushing touchdowns, but Harvard was undone by five turnovers. A 40-yard loss on an errant punt snap gave Princeton one easy touchdown, a costly late-game penalty set up another, and the team's last three possessions of the game were thwarted by Tiger interceptions. In New Haven, meanwhile, an overtime victory against Penn put Yale in a first-place tie with Princeton.

Dawson remained in three-touchdown form at Dartmouth the next weekend, racing 74 yards for a score on the first play of the game and adding two more touchdowns before halftime. The defensive unit and special teams had a big day, forcing six Dartmouth turnovers in a rain-soaked 28-0 shutout. Back at the Stadium a week later, Dawson scored a pair of touchdowns as Harvard downed an improving Columbia team, 24-7. The defense shone again, contributing four quarterback sacks, recovering four fumbles, and holding the Lions to minus-14 yards rushing for the second consecutive year.

Then came another reversal. At Philadelphia's Franklin Field, where Harvard had managed only one victory in a dozen previous visits, the team took on an ill-starred Penn squad that had suffered consecutive overtime losses to Yale, Brown, and Princeton, a streak unprecedented in NCAA annals. Aided by two Crimson fumbles and a pair of interceptions, Penn took a 20-13 halftime lead and held Harvard scoreless the rest of the way, thanks in large part to its kicker, whose last three punts of the game were downed inside

A 7-3 Season

Holy Cross	W	31-14
at Brown	W	38-21
at Lehigh	W	35-33
Cornell	W	33-23
Lafayette	W	24-7
at Princeton	L	28-31
at Dartmouth	W	28-0
Columbia	W	24-7
at Penn	L	13-22
Yale	L	13-34

Yale mascot Handsome Dan XVI, who attended The Game for the first time in 2005, brought his team better luck this year. Snapping a five-year losing streak, Yale gave Harvard a 34-13 drubbing.

Photograph by John Tlumacki/Boston Globe

Harvard's three-yard line. The second punt led to a two-point safety that helped seal Penn's 22-13 win. With a 55-yard carry on his second attempt of the day, Dawson broke the all-time Ivy rushing record, but Penn kept him out of the end zone for the first time in 11 games. "The biggest thing is that we lost this game," Dawson said afterward. "I wanted first and foremost to win an Ivy League championship."

The Penn defeat dropped Harvard to third place, behind Princeton and Yale. Those two had only one league loss each, having gone head-to-head at Yale Bowl on the day of the Harvard-Penn game. With a shot at securing an outright Ivy title for the first time in 26 years, Yale had funked it by giving up two late Princeton touchdowns and losing, 34-31.

So it was that Yale came to the Stadium the next week with a score to settle. The Eli defensive unit played ferociously, containing Dawson and putting heavy pressure on junior quarterback Liam O'Hagan and his receivers. Ominously, O'Hagan was sacked for a 10-yard loss on the team's initial series, and Dawson was thrown for five- and six-yard losses on his first two carries. Harvard mustered only one extended drive in the first half, with Dawson vaulting into the end zone from one yard out as the second quarter began. But Yale, with its offense in high gear, was in command. Adding a pair of field goals to two rushing touchdowns by sophomore tailback Mike McLeod, the Blue held a 20-7 lead at halftime.

That in itself might not have been conclusive. At Yale Bowl a year earlier, Harvard had trailed, 21-3, before rallying for a miraculous 30-24 win in triple overtime. But the Crimson couldn't find the magic dust this year, and after a scoreless third quarter the roof fell in. As the final period started, kicker Matt Schindel '08 dropped back to punt from his own end zone. His shanked kick spiraled out of bounds, Yale got the ball on the eight-yard line, and McLeod immediately ran it in for his third score of the day. Yale safety Steve Santoro delivered the coup de grâce just over a minute later, when Dawson was hit by a swarm of tacklers and parted company with the ball. Santoro scooped it up and ran it back 38 yards, going into the end zone untouched. Harvard managed a consolation score on a 26-yard pass from junior Chris Pizzotti—the starting quarterback in five of the first six games—to senior Corey Mazza, the team's top receiver. But by then it was too late to think of closing the gap.

The 34-13 blowout was Yale's most decisive defeat of Harvard since its 28-0 shutout in 1981. The Bulldogs' inspired defensive play forced four Harvard turnovers, held the Crimson to a season-low 218 yards in total offense, and kept Dawson in check. His longest run of the day, at the start of the second period, covered 14 yards.

"It's difficult to go out this way," said Dawson after the game, "but I've had so many remarkable memories. I'm grateful to have put on this jersey for four years. It's something that is going to bring me a lot of pride for the rest of my life." Indeed. Perhaps the best all-purpose back in Ivy history, Dawson rushed for 1,213 yards in his senior season and finished his college career with a total of 4,841 yards rushing. He led all active Division I-AA players in career rushing yards, all-purpose yards, touchdowns, total points, and scoring.

At 5 feet, 10 inches and 210 pounds, Dawson had the raw strength to shake off tacklers and the speed to outrun pursuing defenders once he got in the clear. He became a formidable blocker, and as a receiver he caught 80 passes, including seven for touchdowns, in his career. Opposing defenses often crammed eight men into the box in an effort to nail him before

Dawson by the Numbers

In his four seasons of Harvard football, Clifton Dawson '07 rewrote the record books.

NEW RECORD	OLD IVY RECORD	OLD HARVARD RECORD
4,841 Yards gained rushing, career	4,715 Ed Marinaro, Cornell, 1969–71	3,330 Chris Menick '00, 1996–99
6,138 All-purpose yards, career	5,117 Chad Levitt, Cornell, 1993–96	4,343 Chris Menick '00, 1996–99
958 Rushing attempts, career	922 Chad Levitt, Cornell, 1993–96	726 Chris Menick '00, 1996–99
66 Touchdowns, career	54 Nick Hartigan, Brown, 2002–05	29 Mike Giardi '94, 1991–93
60 Rushing touchdowns, career	50 Nick Hartigan, Brown, 2002–05	26 Chris Menick '00, 1996–99; Eion Hu '97, 1994–96
398 Points, career	324 Nick Hartigan, Brown, 2002-05	215 Charlie Brickley '15, 1912–14

Dawson also set Harvard single-season records for rushing yardage (1,302, in 2004); rushing attempts (248, in 2004); touchdowns (22, in 2006); rushing touchdowns (20, in 2006); and scoring (132, in 2006). He also set career records for rushing yardage, touchdowns, rushing touchdowns, and points scored in Ivy games only. Crimson teams went 31-9 during Dawson's career—the best four-year won-lost record in Harvard annals since 1919-22, when coach Robert Fisher's teams posted 31 wins, 4 losses, and 3 ties.

Tailback Clifton Dawson dove into the end zone from the one-yard line to put Harvard on the scoreboard against Yale. The second-quarter touchdown, his 22nd of the season, was the 66th of his record-breaking career.

he could get to the line of scrimmage. That tactic was sometimes effective, but Dawson had a way of making football look like an easy game—as when, in this year's Brown victory, his three early touchdowns put Harvard up, 21-0, before the Bruins could make a first down. Or when, in the Cornell game, Dawson took the opening kickoff and sprinted down the sideline for a 93-yard touchdown. His 74-yard touchdown run on the first play of the Dartmouth game was Dawson's sixth career run of 70 or more yards. Before his arrival, no Harvard back had broken a 70-yard run since the 1993 season.

Though his physical gifts were integral to his gridiron success, Dawson also got points for demeanor. "Always a team-first guy, completely reliable, truly and sincerely humble, classy, dignified," said head coach Tim Murphy after the Penn game. "I'm just very happy for him." Opposing coaches concurred. "The class of the league," said Buddy Teevens, the Dartmouth coach. "A wonderful ambassador for the Ivy League," echoed Penn coach Al Bagnoli.

It's a truism that records exist to be broken, and Dawson's Ivy rushing total could be threatened in two years by Yale's McLeod, a fine runner whose 87 yards in The Game raised his two-year rushing yardage to 2,053. Dawson had 2,489 yards in his first two seasons, but come what may, his impress on the Harvard stat sheet is likely to be enduring. His career rushing mark exceeds the old record by a whopping 1,511 yards. His 66 touchdowns more than double the not-so-old record of 29. And his 398 career points have totally eclipsed the 215 scored by Charlie Brickley '15—a venerable record that went unchallenged for 90 years.

TIDBITS: Not since 1912, when the "Big Three" dominated American football, had Harvard, Yale, and Princeton each sported at least seven wins going into the season's last game. The year 1912 also saw the nation's first Big Three presidential election, with Princeton's Wilson outpolling Yale's Taft and Harvard's Roosevelt. But we digress. This season's final Ivy League standings:

	Ivy and overall records		*Points for/against*	
Princeton	6-1	9-1	233	179
Yale	6-1	8-2	257	208
Harvard	4-3	7-3	267	192
Cornell	3-4	5-5	189	217
Penn	3-4	5-5	228	191
Columbia	2-5	5-5	150	163
Brown	2-5	3-7	225	241
Dartmouth	2-5	2-8	147	254

Princeton and Yale last tied for the title in 1989. Harvard placed third that year, too.

Full house: A capacity crowd of 30,723 attended the Yale game....Yale trails, 26-24-1, in games played since the formalization of Ivy League competition in 1956.

Takeaways: Harvard's ups and downs in the last five games of the season reinforced the football axiom that in close (and even not-so-close) matchups, turnovers spin the plot. In the wins over Dartmouth and Columbia, Harvard lost two fumbles while forcing seven and making three interceptions—a turnover margin of +8. Conversely, the margin in the Princeton, Penn, and Yale games was -9 (five lost fumbles and eight intercepted passes, against one fumble and three interceptions given up by opposing teams).

Good hands: With 36 catches, eight of them for touchdowns, Corey Mazza raised his career totals to 1,994 receiving yards and 21 touchdown catches—second only to the all-time records set by Carl Morris '03 (3,488 yards, 28 scoring passes). Injured for most of the 2005 season, Mazza may receive a medical hardship waiver and suit up again next year.

Good foot: Matt Schindel '08 booted his 28th career field goal in the Columbia game, breaking the Harvard record of 27 set by Jim Villanueva '84.

Four in a row: With 120 yards rushing in the Columbia game, Clifton Dawson became the first Ivy Leaguer—and just the ninth back in NCAA Division 1 history—to achieve four 1,000-yard seasons. The only other Harvardians to have run for 1,000 yards or more in a season are Jim Callinan '82, Eion Hu '97 (who did it twice), and Chris Menick '00.

Laurels: For the fourth straight year, Dawson was a unanimous choice for the all-Ivy first team. Former Harvard linebacker Dante Balestracci '03, who captained the 2002 team, is the only other player in league history to have made the first team four times. Also named to this year's first team were defensive tackle Mike Berg (another unanimous choice), receiver Corey Mazza, defensive back Andrew Berry '09, center Frank Fernandez '07, and linebacker and captain Ryan Tully '07....As he did in 2005, Dawson received the Crocker Award as the team's most valuable player. From the Toronto area himself, he's been drafted by the Canadian Football League's Toronto Argonauts and is seen as a possible National Football League draft pick next April.

Captain-elect: Defensive end Brad Bagdis, of Paxton, Massachusetts, and Leverett House, will lead the 2007 squad. A government concentrator, he has been one of the team's top tacklers for two seasons.

Locked in: Head coach Tim Murphy received a five-year contract extension after the season. His teams have compiled an

Photograph by John Tlumacki/Boston Globe

overall record of 80-49 in his 13 seasons at Harvard, winning three Ivy titles and placing 46 players on all-Ivy first teams. Twelve of Murphy's charges have gone on to pro football, including three currently on NFL rosters: Matt Birk '98 (Minnesota Vikings) and Isaiah Kacyvenski '00 and Ryan Fitzpatrick '05 (St. Louis Rams).

Makeover: With Harvard's 133rd football season in the books, the Stadium playing field will be sealed in a giant pressurized bubble. Designed to permit cold-weather use of the 103-year-old facility, the 55-foot-high bubble is part of a three-stage, $5-million Stadium rehab. A synthetic surface was installed last summer (see "The Stadium Returfed," July-August, page 74), and a bank of lights will be erected atop the colonnade. Night football may be right around the corner.

—"CLEAT"

Forecourt Phenoms

Two continents produce two squash stars, each with a knack for the nick.

In the world of college squash, Harvard was once a perennial national champion. The Crimson have bagged 30 such titles, far more than any other college, and reeled off seven consecutive national nine-man championships as recently as 1991 though 1997. But around that time, Trinity College in Hartford, Connecticut, decided to build a powerhouse squash squad with global recruiting, January admits, and strong coaching—and has captured the national nine-man title every year since 1998. In fact, Trinity has not lost a men's squash match in eight years, the longest such streak in the sport's history. They've had some close calls: in the 2004 national team finals, for example, Trinity edged the Crimson 5-4, with the last match going down to the wire.

On the women's side, since a five-year streak from 1993 to 1998, the Crimson women have won only one Howe Cup, representing the national title; that was in 2001. (Trinity's women's program, strong but not as dominant as the men's, won Howe Cups in 2002 and 2003.) Yale is more of a factor in women's squash, having taken the last three Howe Cups.

Harvard, however, still stands tall in the Ivy League. Of the 16 Ivy men's squash titles decided since 1990, Harvard has won 13, all of them outright except last year's, a three-way share with Yale and Princeton. (The Tigers won the other three titles.) Harvard's women have been nearly as dominant, taking 11 of the last 16 Ivy championships, with two others going to Yale, two to Princeton, and one to Penn. Harvard's women went 6-0 in the Ivies last season.

This year, Harvard gathers itself for another run at the top, led by two top players aiming to close out their senior years with milestones. Siddharth Suchde '07 has played at number one in every Harvard men's match since his sophomore year. Last season he went undefeated in all his regular-season matches and was named Ivy League Player of the Year. He lost only one match, in the finals of the season-ending College Squash Association (CSA) national individual tournament. That was against Princeton's Yasser El Halaby, an Egyptian sensation who captured an unprecedented fourth national individual title. Suchde (pronounced such-day) had beaten El Halaby in the regular-season match, and went into the CSA event seeded first, but, as he recounts, "Yasser played out of his skin."

El Halaby has graduated and gone on to play professional squash, leaving Suchde as the college game's preeminent male player. "Sidd controls the court with his speed and his dominance of the T [the center of the squash court, where two boundary lines form a T]," says head squash coach Satinder Bajwa. Only two other men have beaten Suchde since he matriculated at Harvard: Yale's Julian Illingworth, a two-time national champion who has also graduated; and Bernardo Samper of Colombia, a former number-one player from Trinity who graduated in 2005.

But squash is a sport in which younger players are developing so early and so strongly that even the graduation of traditional nemeses doesn't necessarily clear fierce challenges from the path. Take Kyla Grigg '07, Harvard's top woman player. A native of Calgary, Alberta, Grigg transferred to Harvard after one year at the University of Calgary. She was already a world-class junior squash player, and realized "that I wanted to play college squash," she says, "and Calgary didn't have a team." As a sophomore, Grigg immediately played at number one for the Crimson and was named Ivy League Rookie of the Year. She reached the finals of the national individual tournament, losing there to Yale's Michelle Quibell, a two-time national

Siddharth Suchde (foreground) and Kyla Grigg in a squash court at Harvard's Murr Center

Photograph by Tracy Powell

How to Slice a Squash Ball

Topspin rules the tennis court, but in squash—where keeping the ball in the court is rarely a problem—nearly every ball is hit with underspin, also known as backspin or slice. Sliced balls tend to bounce lower and "die" in corners or near walls, making them tough targets to pick up and return. A good squash shot usually also has a good amount of sidespin, which can help "glue" the ball to the side walls as the rapidly rotating sphere gains traction and grabs the wall surface. The longer a ball stays in contact with any of the four walls—or floor—of a squash court, the more difficult it is for an opponent to hit. "Always try to hit the ball before it hits the wall, or right after it comes off the wall," was the advice of Harvard's legendary squash coach Jack Barnaby '32, "because hitting it while it is *on* the wall is impossible."

"A good squash swing should be analogous to throwing a ball the way a pitcher does," explains Siddarth Suchde '07, the Harvard men's top player. "Not too compact, not too tight. You want to be as relaxed as possible." The backswing should come well away from the body, with good spacing between the elbow and the rib cage; it's not good practice to glue one's elbow to the torso. The freer backswing gives the hitter a greater range of motion. A squash forehand resembles a tennis serving motion rotated 90 degrees to the horizontal.

"Most players believe you get a lot of power from the shoulder," says Suchde. "But two-thirds of the squash swing is based in the body. It starts with the rotation of your back and hips and the transfer of body weight forward through the legs, then finishing with an extension of the shoulder." You want to have your knees flexed, lowering your center of gravity and stabilizing yourself.

Grip the racquet with a simple handshake motion that puts the "V" between thumb and forefinger at the top of the handle, says Kyla Grigg '07, the Crimson's number-one woman. Then, cock the wrist, tilting the racquet toward your face. This cocked position gives you more control of the ball. Although the racquet strings do come under the ball to impart underspin to the slice shot—and around the outer edge of the ball, generating sidespin—you don't really want to target the ball with your strings. Instead, Suchde says, "Imagine that you are hitting the ball with the frame of the racquet."

Siddharth Suchde begins his backswing to prepare for a backhand slice. He opens the racquet face to swing. The follow-through shows how the strings come beneath the ball, imparting backspin. Coming around the outside of the ball will create sidespin.

titlist whom Grigg had vanquished in the regular season.

Despite this record, in the fall of 2005, Grigg played at number two for Harvard when Lily Lorentzen '09 arrived and immediately took over the top spot on the Crimson's ladder. Grigg again made the finals of the national individual tournament, but this time lost to teammate Lorentzen in a close match, 9-7, in the fifth game. Playing her friend and teammate was "kind of weird but kind of comfortable, too," Grigg says. "She's the only player you wouldn't mind having beat you. It was nothing new to me—I grew up playing against [my sister] Leona every day, and we'd sometimes play in tournaments." This year, Lorentzen transferred to Stanford, so Grigg, a biomedical engineering concentrator, is back atop the Harvard ladder for her senior campaign. "Kyla is a great counter-attacker," Bajwa says. "If she is reading her opponent's game well, she's unbeatable." She could face Lorentzen again in a match against Stanford in January.

In Calgary, Grigg's parents, older brother, and older sister all played squash; Leona is ranked among the top 100 women pro squash players. Grigg played her first national tournament at age 7 and by 16 was in the world junior championships in Malaysia. After a four-month sojourn in England, she won the Canadian junior nationals, and in the summer of 2003 lost to the eventual world champion, Omneya Abdel Kawy of Egypt, at the junior worlds in Egypt. "The English play very textbook," Grigg says, "with 90 percent of their shots being length shots [hit along the walls to land deep in the back of the court]. The Egyptians are very touch-oriented—they mix it up very nicely and make balls die in the front of the court."

Like Grigg's parents, Suchde's played squash, though only "socially," he says. ("As soon as I started getting a bit better and challenging them, they stopped," he jokes.) Suchde was born in Bombay and played both squash and cricket at the Cricket Club of India there. (The club's squash courts were recently named for Harvard's three-time national champion Anil Nayar '69.) His parents separated when Suchde was 14; his mother moved to Zurich and Suchde was enrolled at the Merchiston Castle School in Scotland.

He played local tournaments and club squash in Scotland with considerable success, winning under-15 and under-17 events, and even doing well in under-19 contests. "A turning point came when I was 16 and I got a call from the Indian Squash Federation asking me to play in the world junior championships," he says. He trained hard and became captain of the Indian junior national team, which finished fifth at the tournament, the best result in India's history. Suchde has remained on the Indian national team for the past five years. Last December he

Photographs by Tracy Powell

played at number three for the Indian senior national team at the world men's team championships in Islamabad, Pakistan. (It meant missing three weeks of classes.) India finished eleventh in the tourney, one of its best performances ever. This year, Suchde, who is writing an economics senior thesis on venture capital in India, will be ready to help Harvard try to win its fourth consecutive Ivy title and perhaps crack the Trinity dynasty.

~CRAIG LAMBERT

ALUMNI

Science and Sculpture

Michael Burke stands amid his artwork as the afternoon sun streams into his New York City studio.

Behind Michael Burke's childhood home in rural New Jersey stands a series of his aluminum sculptures. Called *Quantum Stream*, these seven rectangular parallelepipeds ascend a grassy slope and end in a dark wood. Some are incised with scientific formulas related to magnetism, transpiration/respiration, and the expansion rate of the universe. "The sculptures represent a stream of light," says Burke '60, "a series of quantum packets of energy that come at you across the landscape."

Burke worked as an astronomer and city planner before turning to art full time 30 years ago. He knows a lot about physics, and is fascinated by the interplay among science, art, and emotion. "People are upset when I put anything mystical or romantic in the same sentence with science," he notes. "Science, to them, is a math test." But understanding scientific principles, he would argue, can only add to the power, and beauty, of art. When scientists first explained the quantum nature of light, some feared "this elucidation would destroy the romance of the rainbow," he explains. "But the science of the rainbow is thrilling. It's produced by light passing at an angle through billions of particles of water, and it reproduces itself in reverse in a second rainbow. That's a remarkable, magical thing that, to me, is romance. It doesn't destroy the concept of rainbow, it illuminates it."

To the naked eye, *Quantum Stream* is interesting, even beautiful, to look at. The obelisk-like structures appear to have sprung up out of the ground as bizarre silver trees, or a vertical waterway, among the usual soft and mutable foliage. There is more to that picture. Burke first etched the scientific formulas into the metal with ferric chloride; once he managed to get the light to scatter cleanly off the irregular surface of the etched formulas, he ground the area a bit so that the light scattering itself was affected, making the formulas more difficult to read. "So now you have difficulty seeing the formulas unless you register that the light is scattering," he says. "I wanted to illustrate the actual process, so that the viewer picks up that science is making this happen," just as it is happening through the artwork.

Burke, a son of the prolific literary critic and writer Kenneth Burke, grew up in a radically creative, intellectual household. The elder Burke called himself an "agrobohemian" and moved his family to northwestern New Jersey when Michael was young. Musicians, writers, and artists visited frequently, including poet William Carlos Williams, novelist Ralph Ellison (who read from what would become *Invisible Man*), and literary critic Malcolm Cowley, a longtime family friend who entertained with bawdy songs after dinner. There was no electricity, running water, or telephone, but they did have an Alexander Calder in the outhouse. "He made us a holder for the toilet paper," Michael Burke

Photograph by Arianna Caroli

In the backyard of his childhood home in New Jersey, Burke's *Quantum Stream* brings out the beauty in physics.

says. "It was one of his bent-wire hands, with the middle finger raised."

The atmosphere fostered a sense "that everyone could just do what they wanted to do," Burke says. "And what you wanted to do was supported." In high school, he shied away from writing and the creative arts and felt drawn to the precision of numbers, excelling in math and science. (His older brother, James Anthony Burke '58, Ph.D. '65, studied physics and is professor emeritus of astronomy and physics at the University of Victoria. Their late half-sister, feminist anthropologist Eleanor Burke Leacock, attended Radcliffe before transferring to Barnard.)

At Harvard, Michael planned to become a scientist and "jumped in with a heavy dose of physics and math. But it was a bit *too* heavy for me and I moved into architectural sciences, a background for architects. In truth, I had a renaissance education, which was nice." He took one or two classes in fine arts, and recalls sometimes drawing machinery (a telescope at Harvard's observatory, for instance) because he found something "beautiful about devices that are built solely with a function in mind." He also remembers an advanced calculus course he took with Bernard Dwork, who would fill the blackboard with formulas, remarks, and notations, writing furiously as he lectured. "At the end of class there were all kinds of numbers and symbols, all kinds of formulas, partially written, some half erased—some didn't really make sense," Burke says. "It was really quite beautiful to see."

After graduation, Burke held various posts at the Smithsonian Astrophysical Observatory (including a year as a station manager in Iran), ending up as assistant to the secretary for administration in Washington, D.C. Then he earned a master's degree in urban planning and spent five years working in the field; he also taught the subject at Columbia University. Finally, in 1975, he turned to art.

Burke lives and works in a rambling Manhattan loft with his wife, Julie Whitaker, an English teacher, artist, and writer who recently edited a book of Kenneth Burke's later poetry. (The couple have two grown children, Shannon and Brendan.) His studio is flooded with sunlight from two banks

A Special Notice Regarding Commencement Exercises

Morning Exercises, Thursday, June 7, 2007

To accommodate the increasing number of those wishing to attend Harvard's Commencement Exercises, the following guidelines are proposed to facilitate admission into Tercentenary Theatre on Commencement morning:

•Degree candidates will receive a limited number of tickets to Commencement. Parents and guests of degree candidates *must* have tickets, which they will be required to show at the gates in order to enter Tercentenary Theatre. Seating capacity is limited, however there is standing room on the Widener steps and at the rear and sides of the Theatre for viewing the exercises.

Note: A ticket allows admission into the Theatre, but does not guarantee a seat. The sale of Commencement tickets is prohibited.

•Alumni/ae attending their major reunions (25th, 35th, 50th) will receive tickets at their reunions. Alumni/ae in classes beyond the 50th may obtain tickets from the Classes and Reunions Office, 124 Mount Auburn Street, sixth floor, Cambridge, Massachusetts 02138.

•Alumni/ae from non-major reunion years and their spouses are requested to view the Morning Exercises over large-screen televisions situated in the Science Center, Sanders Theatre, most of the undergraduate Houses, and the professional schools. These locations provide ample seating, and tickets are not required.

•A very limited supply of tickets will be made available to all other alumni/ae on a first-come, first-served basis through the Harvard Alumni Association, 124 Mount Auburn Street, sixth floor, Cambridge, Massachusetts 02138.

Afternoon Exercises

The Harvard Alumni Association's Annual Meeting convenes in Tercentenary Theatre on Commencement afternoon. All alumni and alumnae, faculty, students, parents, and guests are invited to attend and hear Harvard's President and the Commencement Speaker deliver their addresses. Tickets for the afternoon ceremony will be available through the Harvard Alumni Association, 124 Mount Auburn Street, sixth floor, Cambridge, Massachusetts 02138.

—Jacqueline A. O'Neill, University Marshal

Photographs courtesy of Michael Burke

of windows that overlook West 36th Street. The sounds of cars and trucks filter in from the congested streets below; the 12-story building, bought with a group of artists in 1978 for little more than back taxes owed, is in the Garment District, not far from the Lincoln Tunnel. The studio itself is full of surprising objects: aluminum sculptures that rise nearly to the ceiling, whimsical metal books on the counters, huge canvases on the wall that combine drawings, etchings, or photographs with metal sculpted pieces attached to them, and an array of saws, drills, and a pegboard fitted with screwdrivers, wrenches, and pliers. Scraps of aluminum fill the corners because he rarely throws anything out.

It can take the average viewer a moment to warm up to the beauty in Burke's work. The pieces are silvery, spare, and filled with singular geometries. There are no bright colors—everything is black or white or metallic gray. (His work is privately collected and owned by several museums, including the Biblioteca Nazionale in Florence and the Paterno Library at Penn State University.)

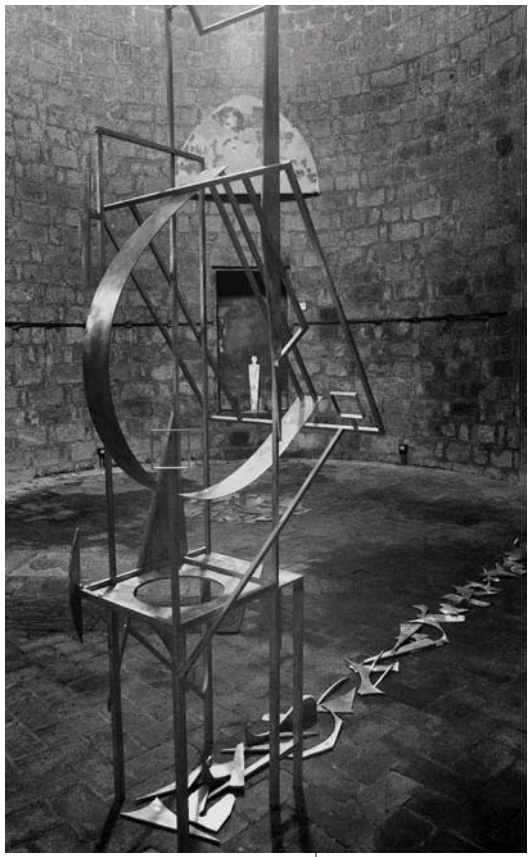
Sometimes his work is displayed for scientists, most recently at a 2004 exhibit at Rockefeller University celebrating mathematical physicist Mitchell Feigenbaum's contributions to chaos theory. Feigenbaum, who owns a few of Burke's pieces, commissioned one of the artist's signature metal books for the show. The hinged sculptures, ranging in size from eight inches to six feet, are made of aluminum, sometimes with paper pages. This one features four pages with cut-out geometric designs; parts of Feigenbaum's own "chaos constant" formulas are incised, with the digits running off the last page.

Not all of Burke's fans are science-minded. "I wouldn't in my wildest dreams begin to understand the formulas and numbers and whatnot he puts in some of his pieces," allows Robert Edgar '69, vice president of donor relations at The New York Community Trust. "The fact that they are real formulas adds another level of complexity to the art—as in T.S. Eliot's allusions—but not understanding them doesn't detract from the beauty of the piece itself."

Edgar has several pieces by Burke in his Manhattan dining room. One consists of a drawing of a male nude and four subsequent images of the figure blown up to the point that they lose any resemblance to a human being. "It's saying, 'This is what happens when you look in a microscope,'" says Edgar, who met Burke when their daughters were at the same elementary school. He particularly loves his four-page metal Burke book with cut-out shapes of a male stick figure and an obelisk. "It's tactile, like so much of Michael's work," he adds. "The book begs you to touch it, spin it, and look through it. There's also something poetic about it, because as the light hits the aluminum and you turn it around, the books gives you different reflections and reflective moments. My wife and I are enthusiastic readers and this sculpture has the same effect as dipping into a wonderful book."

Burke's concertina-style *Millennial Fable* book has hinged aluminum covers, but inside the etched paper pages depict a whimsical history of mathematics that works its way up to Heisenberg's uncertainty principle. "The books can stand, as though they were stage sets, allowing a simultaneous reading of the pages," Burke explains. "A book is read sequentially, but is remembered in a multitude of different sequences. To illustrate this, I make prints from individual pages and show them in a number of different overlapping patterns. In this fashion I can end up with a book 'installation'—the book, standing as sculpture, surrounded by images that represent the infinite ways the reader keeps the images from the book in his mind."

One of Burke's signature metal books depicts a history of mathematics.



***The Neutrino Chronicles* puts modern-day physics into an ancient tomb.**

In these crafted works, Burke sees the influence of both his parents. Kenneth Burke was a wide-ranging, voracious reader who collected a library of about 7,000 volumes, most of which are still stored in the New Jersey house. "He loved the word," his son says. "He never drew a picture in his life." In contrast, Burke's mother, Elizabeth Batterham Burke, was good at math, but was also a fine artist who competed for wall space for her artwork. "Like many kids," he says, "I stuck the best of both of them together. The words or the formulas or the schematics are usually there in the sculptures."

Burke is attracted to the confluence of

seemingly contrasting ideas: hard science and romance, numbers and poetry, unreadable picture books, the ancient past and the present. His material of choice, aluminum, is a commonplace, modern metal used most often for industrial—not artistic—purposes.

One of his boldest aluminum pieces, *The Neutrino Chronicles*, was first displayed in an Etruscan tomb. That was in 2000, during an arts festival in a town north of Rome, and visitors to the tomb came upon what Burke describes as "a shiny, new 14-foot machine—mysterious, but clearly with some kind of scientific purpose—in the middle of this cave riddled with history." (The piece holds a polished aluminum arc that rises out of a rectilinear metal scaffolding ground to such a high polish that it appears to glow. Beneath the machine lie dozens of angled aluminum pieces, many etched with quantum formulas and/or with Etruscan script.) "Both science and the Etruscans have a mystery that engages people," Burke asserts. "The formulas and the script mean so much, but both are so hard to decipher. It's a moment when the unknowns of science and those of the Etruscans interact. I like the conflict between drawings from a distant past and a metal that didn't exist then."

It doesn't matter to Burke whether people understand the formulas; he often reverses them or writes them upside down "to relieve people of the pressure" of "getting" the science. New York City art collectors Mary Anne Schwalbe '55 and Douglas Schwalbe, M.B.A. '52, have several Burke pieces, including a tall aluminum tower that sits on their terrace. It contains equations and symbols, but it also has tiny metal squares that can be picked up, played with, and used to cover the symbols. Burke has twice replaced the pieces because the Schwalbe grandchildren have so enjoyed using them on the sculpture. "It's a magical piece. He's highly imaginative and also very skilled," Mary Anne Schwalbe says of Burke. "His drawings as well as his sculptures are technically perfect." Yet she begs off when asked to translate the scientific formulas. "I don't understand them, but it is important to me that they are there. I find the art fascinating," she says. "He can explain it all, and it is very much a part of who he is."

Burke is intent on celebrating the beauty and power of science in his sculptures, but the art is not agitprop: he weaves science into the sculptures subtly, with style and humor, and in ways that are never doctrinaire. The mischievous burnishing of incised equations, making them hard to read, is a good example: he interferes with the ability of quanta to bring information to us in order to call attention to the phenomenon itself. But he doesn't insist that people understand the scientific fine print. "I want people to know there's a logic, a science in the art," he says, but "there's no test afterwards."

—ANNE EISENBERG *and* NELL PORTER BROWN

Anne Eisenberg writes "Novelties," a biweekly column for the Sunday Business section of the New York Times. *Nell Porter Brown is assistant editor of this magazine.*

Comings and Goings

University clubs offer a variety of social and intellectual events. Following is a partial list of Harvard-affiliated speakers appearing at local clubs this winter. For further information, contact the club directly, call the HAA at 617-495-3070, or visit www.haa.harvard.edu.

On January 23, David Powell, an associate of the Davis Center for Russian and Eurasian Studies, speaks to the Harvard Club of San Diego. On January 26, the Harvard Club of Cape Cod hosts Marshall Goldman, senior scholar at the Davis Center, for a discussion on "Putin, Petroleum, Power, and Patronage: The Dog Barks, but the Caravan Moves On." On February 28, associate professor of government and social studies Glyn Morgan lectures on "Morality and Terrorism" for members of the Harvard Club of Cincinnati.

Radcliffe and Other "Shared Interest Groups"

AMONG THE University's new Shared Interest Groups (SIGs) is the fledgling Alumnae and Friends of Radcliffe College, led by Ellen Gordon Reeves '83, Ed.M. '86. Long active with the Harvard Alumni Association and a former Radcliffe Association board member, Reeves says she helped create this new organization "to honor and show respect for the pioneering women who went to and created Radcliffe." It is open to women as well as men from any class and offers alumni "another way to connect to each other, to undergraduates, young alumnae, and the University," she says. "It is not meant to replicate the Radcliffe alumnae associations of the past, but it is a way for women to reorganize themselves as alumnae."

SIGs in general do not supplant clubs, classes, and other traditional alumni groups and networks. They are defined by the Harvard Alumni Association (HAA) Executive Committee as "any collection of Harvard University alumni who actively engage in communicating and/or gathering around a central unifying purpose, mission, background, or activity beyond class affiliation or regional proximity." Each group is its own nonprofit entity with a mission statement, dues, membership policies, and meeting schedules. The HAA does not provide funding to SIGs (nor does it for clubs and classes), but does consider them "a critical part of what connects so many alumni with each other and with Harvard." Thus they do receive logistical help, guidance on operations, on-line tools with e-mail capabilities, access to mailing addresses for all self-selecting alumni, representation at the HAA directors' thrice yearly meetings, and a yearly news item in the HAA's e-newsletter, *Harvard Monthly.*

There are now nine alumni SIGs (opposite), and the list is expected to grow. "We're in conversations with five to seven more groups at this time," says Lauren Brodsky, assistant director of clubs and SIGs at the HAA. "In the same way that clubs have been brought closer to the HAA in recent years, so the SIGs are now going through that process." Overall, the pooling of resources and enhanced communication among alumni groups, the HAA, and its committees should yield "best practices."

The HAA first approved policies and operating principles to support SIGs in

February 2004. Under the rules, for example, SIGs cannot raise money for any purpose not related to their "stated core mission," and any political activity must carry a disclaimer that the group does not "represent the President and Fellows of Harvard College (Harvard University) or the Harvard Alumni Association."

The Harvard University Muslim Alumni group (HUMA) decided to become a SIG partly because the HAA offered "impressive" organizational support and successfully welcomed them, says HUMA president Shahzad Bhatti, J.D. '97, M.P.A. '06. Formed in 2004, the group now has about 200 members around the world. Its goals include linking Muslim alumni to one another, strengthening ties to undergraduate Muslim groups, and "working with young Muslims to encourage them" to apply to Harvard. "Also, in light of the contemporary political environment that we live within," Bhatti adds, "we view it as part of our mission to work with others in the Harvard diaspora to foster dialogue and ensure that an accurate image of Islam exists within and around the Harvard community."

Bernard E. Kreger '59, M.P.H. '70, a leader of the Harvard Glee Club Foundation, now a SIG, hopes easier access to alumni records will help Glee Club members, especially the younger ones, better stay in touch with each other—and "interact more with the Glee Club when it tours and even when it appears locally."

The largest SIG to date, with upwards of 4,000 members nationwide, is the Harvard Gay and Lesbian Caucus, founded by alumni in 1984 as an "issue-oriented advocacy group specifically to press Harvard to include sexual orientation in the University's nondiscrimination policy, as well as to advocate in general for LGBT students, faculty, and staff," says current president Tom Parry '74. He sees the HAA's embrace of these diverse organizations as a positive step. "Most women, gay, and black alumni did not have great experiences with Harvard in the 1950s through the 1970s, and these organizations, formed by alumni outside of Harvard, have offered ways for them to connect with friends who came out of the same crucible," he explains. "Harvard is discovering that there is a lot of energy in these groups that can be tapped."

Alumni interested in learning more about SIGs and the HAA may visit http://post.harvard.edu/harvard/clubs/-html/SIG.html, or contact Brodsky at 617-496-0493 or lauren_brodsky@harvard.edu.

Eternal Creatures

Top: A nudibranch. Bottom: A "by-the-wind sailor" sea jelly.

Some 29 sea creatures from Harvard's Blaschka Collection, exquisitely rendered in glass in the nineteenth century, are now on display in a special exhibit at the Underwater Adventures Aquarium near Minneapolis/St. Paul. *Glass Sea Treasures from Harvard: The Age of Darwin* is the largest group of Blaschka invertebrate models that the Museum of Comparative Zoology has ever allowed to travel; most of them have not been seen publicly in more than a century. (Their Czech-born creators, father and son Leopold and Rudolf Blaschka, also produced exclusively for Harvard the renowned glass flowers now on display at the University's Museum of Natural History.) Darwin's work in the mid 1800s sparked interest in the "variations of species," notes aquarium president Todd D. Peterson '84, M.B.A. '87. "The Blaschkas were not making 'artistic' pieces; they were using their talents to make exact scientific replicas, translating drawings coming back from this bold new age of expeditions. People wanted a way to see these exotic sea creatures in three dimensions."

UNDERWATER ADVENTURES AQUARIUM/COURTNEY CONK

Todd D. Peterson

Glass, Leopold Blaschka once wrote, "is such a changeless thing that we do not dare in its construction to make a mistake; it becomes eternal." In their Dresden studio, the two men produced hundreds of the glass invertebrates (and many other objects, such as glass eyes) and sold them to museums and private clients throughout the world. (One of the largest collections of their work was destroyed during the bombings of Dresden in World War II.) When Rudolf died in 1939, so did the Blaschkas' singular art; he had no apprentice.

The exhibit is on display until Labor Day. For details, visit www.minnesotaaquarium.com.

SIGs and Contacts

Alumnae and Friends of Radcliffe College, Ellen Gordon Reeves '83, Ed.M. '86, *ellenreeves@post.Harvard.edu*

Harvard Alumni Startups, Betsy J. Campbell, Ed.M. '93, *www.harvard-startups.org*

Harvard Black Alumni Society, Danice L. Woodley '00, J.D. '05, *www.hbasonline.org*

Harvard Gay and Lesbian Caucus, Tom Parry '74, *www.hglc.org*

Harvard Glee Club Foundation, Bernard E. Kreger '59, M.P.H. '70, *www.harvardgleeclub.org*

Harvard Student Agencies Alumni, Brian Feinstein '07, *www.hsa.net/alumni*

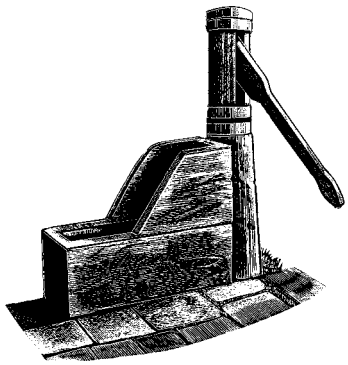
Harvard University Muslim Alumni, Shahzad A. Bhatti, J.D. '97, M.P.A. '06, *www.harvardmuslims.org*

Harvard Women's Leadership Project Alumni Network, Rucker Alex '99, *www.womensleadershipproject.com*

Harvardwood (alumni working in Hollywood), Mia Riggin Riverton '99, *www.harvardwood.org*

Photographs courtesy of the Harvard Museum of Comparative Zoology

Harvard in Epigram



"Your wooden arm you hold outstretched to shake with passers-by."

WORD of Fred R. Shapiro, J.D. '77 ('80), in these pages first came in 1979 after he revived tiddlywinks at Harvard. At the North American Continental Team Championship meet at MIT that year, Shapiro, president of the Harvard Tiddlywinks Society, told a magazine reporter the history of tournament tiddlywinks, which the reporter revealed in a lengthy feature, "Relatively New Indoor Sport Sweeps about 125 People" (May-June 1979, page 37).

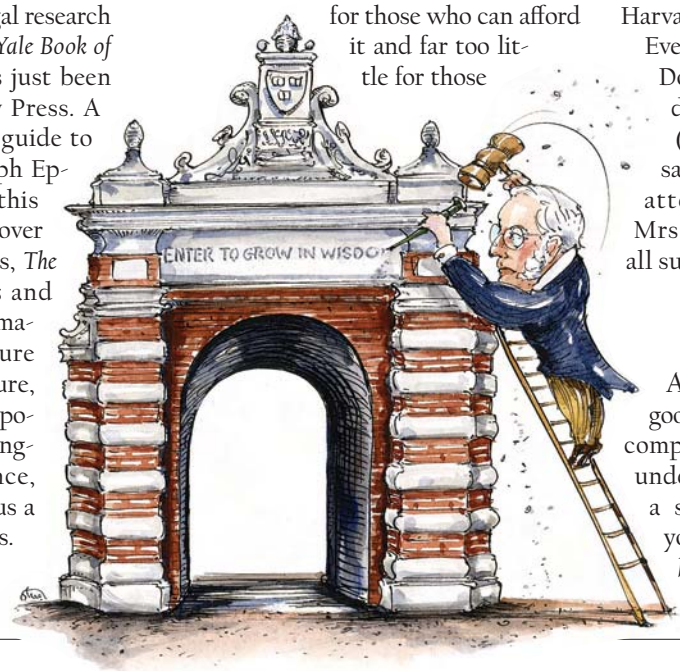
Shapiro has gone on to become associate librarian and lecturer in legal research at the Yale Law School. *The Yale Book of Quotations*, edited by him, has just been published by Yale University Press. A dictionary of quotations is a guide to the spirit of its time. As Joseph Epstein notes in the foreword, this one "shows a strong increase over its two main rivaling volumes, *The Oxford Dictionary of Quotations* and *Bartlett's Familiar Quotations*, in material from American literature and journalism, popular culture, computer culture, and contemporary proverbs." Singer and songwriter Bob Dylan, for instance, gets a whopping 27 entries, plus a photograph of himself in shades.

The index lists no *mots* about tiddlywinks, but it does include references to Harvard and to Yale. Harvard presidents of the past century or so cited by Shapiro include Charles W. Eliot, with two entries, one being: "Enter to grow in wisdom./Depart to serve better thy country and thy kind," the inscription carved in 1880 on the Dexter Gate to Harvard Yard.

President A. Lawrence Lowell has one entry, quoted in *Reader's Digest* in May 1949, on why universities have so much learning: "The freshmen bring a little in and the seniors take none out, so it accumulates through the years."

James Bryant Conant's four entries include: "Behold the turtle. He only makes progress when he sticks his neck out," quoted in *The American Treasury: 1455-1955*, edited by Clifton Fadiman, 1955.

Derek Bok has two entries. The first is from his article "A Flawed System" *(Harvard Magazine*, May-June 1983, page 38): "There is far too much law for those who can afford it and far too little for those who cannot." The second was attributed to Bok in Paul Dickson's *The Official Rules* (1978). An earlier occurrence, without attribution to any individual, was in the *Washington Post* of October 6, 1975: "If you think education is expensive—try ignorance."



No utterances of Presidents Lawrence H. Summers, Neil L. Rudenstine, or Nathan M. Pusey are noticed by Shapiro. He gives six references to Harvard in general and three to Yale.

Among Harvard's entries is, of course, Arthur Twining Hadley's remark in 1906 in the *Chicago Daily Tribune*, "You can always tell a Harvard man when you see him, but you can't tell him much." And William F. Buckley's judgment in *Rumbles Left and Right* (1963): "I should sooner live in a society governed by the first two thousand names in the Boston telephone directory than in a society governed by the two thousand faculty members of Harvard University."

Ever playful, Shapiro cites a remark by Dorothy Parker reported by Alexander Woollcott in *While Rome Burns* (1934): "And there was that wholesale libel on a Yale prom. If all the girls attending it were laid end to end, Mrs. Parker said, she wouldn't be at all surprised."

AND FINALLY, PUNKS. "He had the good looks of a Sicilian dandy and the composure of a Harvard graduate, but under that high-priced façade he was a street punk named Ponti. The younger." ~*From* Black Alley *(1996), by Mickey Spillane (1918-2006). R.I.P.*

~PRIMUS V

Illustration by Mark Steele

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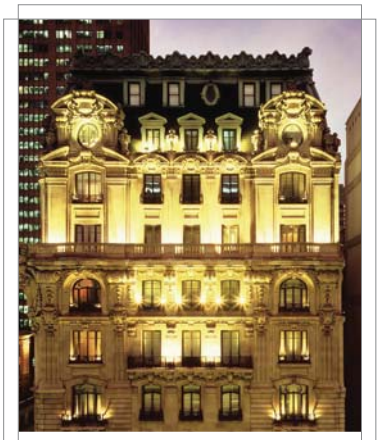

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Very good-looking with devilish twinkle and generous loving persona. Exudes poise, grace and readiness for life. Divorced, Jewish, Boston woman — characterized by male colleagues as "smart, full of fun with terrific sexy slender figure — adds light and laughter wherever she goes." Beguiled by excitement of travel, adores stepping into unknown cultures yet believes New England beaches trump Cote d'Azur. Reads New Yorker cartoons weekly, works toward social justice, stays fit with biking, yoga. Loves literature, Mozart, Italy anywhere, Wyoming, Kenyan safari, the warm ambiance of meals with friends, lattes, London theatre, Ansel Adams. Seeks educated, professionally and personally secure, fit, man — 50's - 64. stellablue567@yahoo.com.

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Adorable, smart, Boston blonde with a laugh-at-oneself sense of humor and show-stopping blue eyes. Petite, slender and delicate with nonetheless big presence, something of a firecracker. Light of heart, believes good manners are the ability to help people feel at ease. Passionate golfer, great dancer. Easygoing with backbone, known for long fuse. Philanthropic, entrepreneurial, imaginative. Respectful and interested, sustains friendships from grammar school. Willing to try almost anything that is lively, new, honest and ethical. A good round of golf, a great meal, theatre, my dog, Aspen in July, an evening sail, world peace, visiting international friends, traveling business or First, St Andrews, Bermuda, Barcelona, anything Latin (especially music, Weinert Mlabec, tango). all bring me joy. Seeks attractive, financially solvent, golf-playing, man 57-68. yllas42@yahoo.com.

Tall, slender artist with passion for the outdoors. Talented painter started watercolors 10 years ago, now shows regularly. Instantly appealing with quiet beauty and heartfelt warmth. Considered fun to be around and completely real with the very essence of attractiveness in a woman. Generous community member, able skipper with published book of paintings. Believes in romance and finding that special sparkle. Actively enjoys hiking White Mts or Cornwall, cross country skiing, dinners in cozy restaurants, painting trips to Greece, Monhegan, Brittany, tennis, sailing around Buzzard's Bay. Seeks warm, personable man, very physically fit and active, mid 50s to early 70s — within 100 miles of MA Southcoast for convenience of lasting relationship. 508-951-1438, tashmoo3@yahoo.com.

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Good-looking MD with Southern roots and great capacity for love and mutuality, everyone who meets her loves her. Graceful, athletic, and musical. Laughs often and much. A soft radiance and sexy voice. Thin shapely build, thankfully inherited slender gene. Physically resembles Charlotte Rampling. Humanist and natural scientist universally described as tons of fun. Widow, birder, snorkeler, orchid grower. Renaissance interest in the world: yoga, Belize, Wallace Stevens, William Trevor, dogs, dancing, never tires of Vivaldi and Puccini. Seeks nonsmoking, intellectually interesting man, 48-64, 5' 9"+ who cares about fitness, enjoys life. hylocichla.mustelina@yahoo.com; 617-417-4710.

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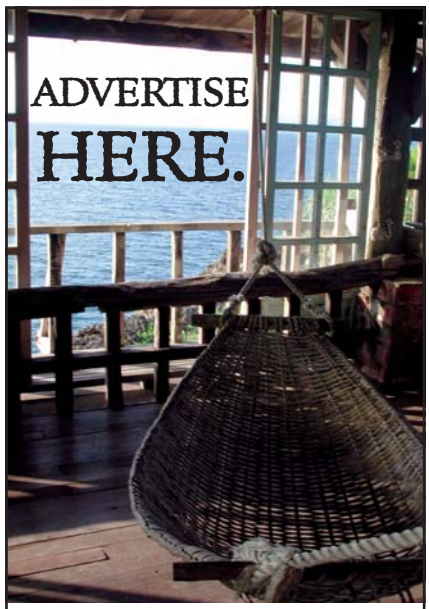

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real sense of what it is like to live in countries outside the United States are those who have done it. Most especially, we don't know anything about other systems of politics and economics.

Mixed economies and democratic socialism have been tried, with considerable success, in Western Europe and Japan, where the average blue-collar worker lives a lot better than his or her American counterpart. We could consider a day in the life of the Swedish car mechanic, or the German secretary, or the French shop clerk, or even the British steelworker on unemployment. Why don't we? Because we don't even know where to find out how they live. We are as isolated from the rest of the world as the poor little Soviet children we learned about in grade-school geography.

Marian Henriquez Neudel '63, Div. '67
Chicago

AN UPSWING FOR POETRY

It's great news, of course, that Ifeanyi Menkiti has enabled the Grolier Poetry Book Shop to survive ("Grolier Reincarnated," by Nathan Heller, November-December 2006, page 30). His hopes for the store may not be unrealistic. Although you quote former owner Louisa Solano as saying, "There's more interest in hearing a poet read than in actually reading the book," the fact is that poetry book sales have been on an upswing in recent years. In the Pitt Poetry Series, which I edit, five or six books have sold 40,000 to 100,000 copies and many others have gone into multiple printings. The numbers are much better than 10 or 20 years ago.

As for Solano's rather sour comment that younger poets are "writing like their instructor," I see an enormous diversity among younger writers in style and content, a diversity that reflects that of the country itself and that is evident in *American Poetry Now,* a forthcoming anthology I've edited. I'd invite your readers who are unfamiliar with contemporary poetry to become reacquainted with what Dylan Thomas called the oldest and the greatest of the arts.

Edwin Ochester, A.M. '63
Pittsburgh

IMPLAUSIBLE PERSONALS

Delicate bone structure? Magical smile with dancing eyes? Seriously pretty with devilish twinkle? Lots of range and depth? Who are these people? Or more to the point, where the hell were they when I was dragging myself, pale and unappealing, down those hallowed halls? Are there so many Grace Kelly-by-way-of Marie Curies sporting Ivy diplomas? An endless supply of athletically proficient male lovers, eager to nibble ears and escargot? And if so, what the hell are they doing so...single? Aren't there any sloppy magnanimous souls out there?

More appropriate would be: "Neurotic overachiever who can't relax seeks great-on-paper partner to impress parents and competitive friends. Unwilling to compromise, control freak, fear of intimacy and failure. Recurring nightmare of arriving late to lecture. Interests include résumé building, winning, and listing interests."

Bless you all for your God-given talents or your penchant for narrative. May you mate happily and impressively.

Gregg Hurwitz '95
Los Angeles

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(continued from page 30)

one assumes that they are sad: 'You can't read.' 'But I *can* read.' 'You can't get around.' 'But I *can* get around.' People *do* feel devastated if they go blind, but it does not last. The human mind is constituted to make the best of the situations in which it finds itself. But people don't know they have this ability, and that's the thing that bedevils their predictions about the future."

One of Gilbert's colleagues, professor of psychology Ellen Langer, prefers to spend her time in the present, and she aims to analyze and share that experience with others though her many books—like *On Becoming an Artist: Reinventing Yourself through Mindful Creativity*—all of which explore her central theme of mindfulness. To Langer, mindfulness means noticing new things and drawing new distinctions. "It doesn't matter whether what you notice is smart or silly," she says, "because the process of actively drawing new distinctions produces that feeling of engagement we all seek. It's much more available than you realize: all you need to do is actually notice new things. More than 30 years of research has shown that mindfulness is figuratively and literally enlivening. It's the way you feel when you're feeling passionate."

Everyone says they want to live in the present, but there's a paradox: "If you're *not* in the present, you're not there to know you're not there," says Langer, with a smile. "So how do you get there? This work tells us how: when you're actively noticing new things, you become more aware of context and perspective. You end up with a healthier respect for uncertainty, something we are taught to fear. Our baseline state should be mindful; it's how we should feel virtually all the time."

What stops us, according to Langer, are our fears of evaluation, our acceptance of absolutes, and our mindless ideas about mistakes. All three are actually different facets of the same sensibility. "Anything hierarchical suggests that there is a single metric—a 'right' way of understanding the world, and better and worse ways to view things," she explains. "But the world is a social construct. Mistakes are not mistakes in all contexts. With writing and art, mistakes tend to make the product more interesting. The major difference between a machine-made rug and a handmade one is that the regularity of the machine-made rug makes it uninteresting. Errors give the viewer something to hold onto. When you make a mistake in a painting, if—instead of trying to correct the mistake—you incorporate it into what you are doing and go forward, you are working mindfully. And when we ask viewers to choose between this kind of art and 'flawless' works, people say they prefer the mindfully created pieces.

"We also have mistaken notions of talent," Langer continues. "People learn about activities as if there are absolute standards. Think about a jockey, a boxer, and an archer: three very different sports. Which one has athletic 'talent?' Or suppose someone tells you that you have no artistic 'talent'—you can't be a Pollock, Mondrian, Klee, or Picasso. But they are so different from each other! Act mindfully, and that state of consciousness leaves its footprint in what we do. Mindfulness is the essence of charisma; when people are there, we notice. When you don't take the world as given, but as full of possibilities, it becomes endlessly exciting."

"Mindfulness is the essence of charisma. When you don't take the world as given, but as full of possibilities, it becomes endlessly exciting."

—ELLEN LANGER

The positive psychology class Ben-Shahar teaches at Harvard aims to keep its students engaged and excited, too. As they filter in, sit down, and boot up their laptops, a Whitney Houston song plays through the sound system in Sanders Theatre. Ben-Shahar, in black slacks and a blue pullover sweater, fiddles with his own laptop and brings up the first image on the screen for today's lecture on self-esteem: it's a *New Yorker* cartoon of a troubled man writing in his diary, "Dear Diary, Sorry to bother you again..." During the lecture, Ben-Shahar will flesh out his discussion with images and film clips, along with concepts and research citations. He also shares a personal experience with the class, telling how, in his 20s, as a College graduate who had been a national squash champion, he nonetheless "realized that I didn't have the answers. External validation broke down. I had the success and validation, but still experienced low self-esteem."

This is another way that positive psychology classes are different: they are experiential. "There are two levels to the course," Ben-Shahar says. "One is, like any other course, an introduction to the research and to the field. But secondly, students explore ways to *apply* these ideas to their lives and communities. They write response papers and perform exercises, connecting these theories with their own lives and experiences. We try to ask, to use William James's phrase, 'What is the cash value of these ideas?'"

It is clear that the "cash value" of positive psychology can be far greater than enhanced well-being, though that is a good start. Vaillant brings up one of positive psychology's constructs, forgiveness, in contrasting the Treaty of Versailles and the Marshall Plan. After World War I, Germany agreed not only to apologize but to send its countrymen to rebuild France. The French rejected this on the grounds that it would hurt employment in France if the Germans rebuilt it, and insisted instead on monetary reparations. In contrast, Vaillant says, "The Marshall Plan put people in Gary and Pittsburgh out of work by giving the Germans and Japanese more efficient steel mills. But the result of Versailles was World War II and the Holocaust. The Marshall Plan led to 60 years of peace in Western Europe for the first time in recorded history."

Forgiveness, of course, means trusting someone who has hurt you, and so inevitably runs a risk. But positive psychology says such risks are worth taking. "You hope to free up people in their lives," says Langer, "so they will take more chances and live more before they die."

Craig A. Lambert '69, Ph.D. '78, is deputy editor of this magazine.

AN "ORACLE OF AQUA"

(continued from page 52)

Soaked: Thoreau's Engagement with Water, and will do for Harvard University Press "Singular Element, Interestingly Strange: Thoreau's Natural History of Water." His cat has just finished a work of fiction now in press, *The Aquatic Cats of Concord*, about Thoreau's felines, who led lives of quiet contemplation. Turns out that these pusses, fished from a river or blessed with other watery associations, taught Thoreau much of what he learned about nature, which is why he was so acute an observer of birds.

Empowered by various grants, France has done much traveling in the past year, which he took off from teaching, although he did go to lagoon city—Venice: how could he not?—to lecture in Harvard's Summer School program there on restorative ecology and its positive message for the future state of our wounded world. (He entertained himself while there with Donna Leon mysteries, whose heroes get around on, and villains sometimes wind up in, Venice's canals.) He looked at archaeological sites in Syria and elsewhere around Iraq to see how ancient Mesopotamians managed water. He swam in the Euphrates and splashed Tigris water in his face. In Jordan he visited successful sustainable environmental development projects and went to biblical sites along the Dead Sea.

On the islands of Bahrain, home of the ancient civilization of Dilmun, where Gilgamesh went to find immortality from the Noah character who had survived the flood, he studied tombs. Bahrain is a puzzlement; it had until recently the highest concentration of prehistoric tombs anywhere in the world, many more than its small population would have required. One theory is that when a rich Mesopotamian died, his corpse took a two- or three-day boat trip to be interred there, in heaven. Dilmun was as well a trading entrepôt between Mesopotamia and the Indus Valley. Fresh springs flowed water underneath Saudi Arabia to pop up on the floor of the ocean in Bahrain, creating a salubrious mix of fresh and salt water that in Gilgamesh's day and thereafter nurtured the best pearls in the world.

France took a break from water in the fall to walk another 250 kilometers of the pilgrimage route from France to Santiago de Compostela in Spain. He likes to walk in cultural landscapes and has just edited a book of "quotations of encouragement" for fellow travelers, *Ultreia! Onward! Progress of the Pilgrim*. (He means to walk the Blackstone Canal from Providence, Rhode Island, to Worcester, Massachusetts; the Middlesex Canal that connected the Merrimack River to the port of Boston; and possibly the Erie, from the Hudson River to Lake Erie, and says he will probably write a book about them.)

Robert France at the Alewife Brook Reservation. He played a major role in creating a master plan to transform the now scruffy wetland into a public park and rain garden to "polish" Cambridge's stormwater.

After France and Bahrain, he was off to Cambodia to explore Tonlé Sap, the largest freshwater lake in Southeast Asia. In the dry season, it is very shallow and covers between 2,500 and 3,000 square kilometers. But the monsoons swell the lake to more than five times that size. Its ecosystem is so rich in fish and other wildlife that it is the main source of animal protein for much of the population of Cambodia.

France went to Tonlé Sap for a project in progress—a richly illustrated, popular book, or series of books, on the great lakes of the world, "where fiction fuses with history, nature with culture, all becoming confounded into myth." He is about three-quarters of the way through his researches into candidates for the book: Walden Pond, of course, West Lake in China, Grasmere and Windermere in the English Lake District, the Sea of Galilee, Lake Dal in Kashmir, Lake Biwa in Japan, Lake Como in Italy, and the lowest point on earth, the Dead Sea. Last year he went to Bolivia and Peru, to the highest navigable lake on earth, Lake Titicaca, which the Incas called the womb of mankind, where he saw people living on floating reed islands reminiscent of those of the Marsh Arabs. They make money from ecotourism, says France, as the Iraqis might do themselves one day, presuming there is an Iraq.

Now France is back in class, offering this term an elective course at the design school on the influence of landscape development on urban and rural aquatic systems, on how the design of these systems can be used to mitigate the deleterious impacts of watershed development, and on design principles in the restoration of degraded waterways. In the College, he teaches a freshman seminar called "The Invention of Nature," about whether nature is real or a cultural construct, and about how some humans design hyper-natures like Disney's Wilderness Lodge, while others reclaim degraded sites as ecotourism centers.

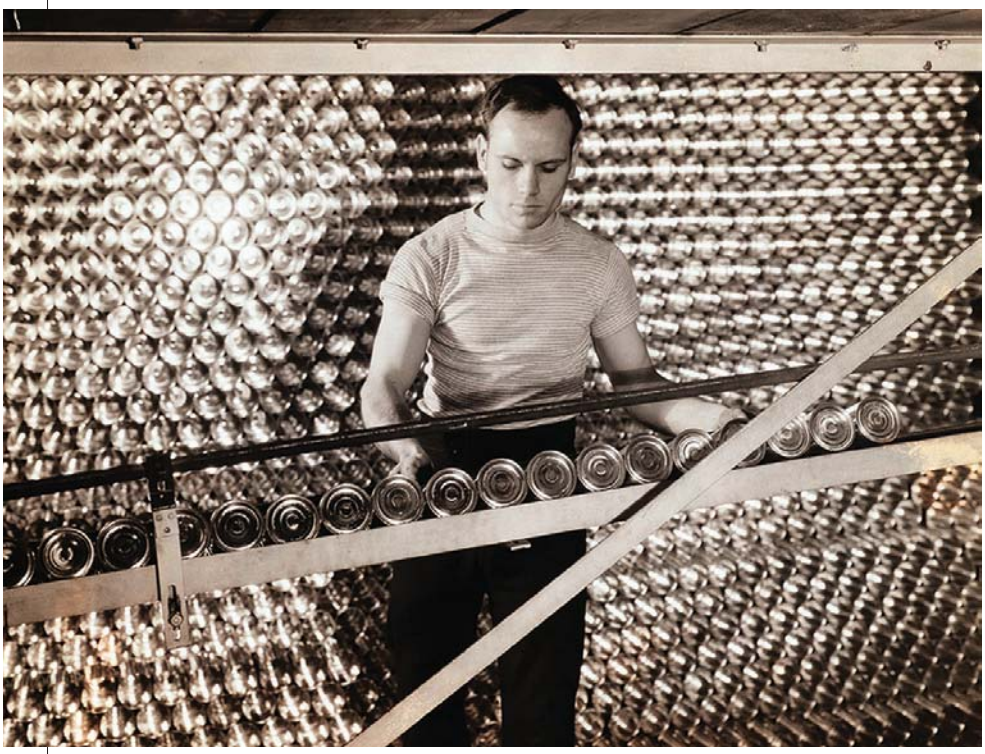
While he may not ask questions about it on examinations, he will hope that all his students heed Thoreau's instruction to "share the happiness of the river," for he or she "who hears the rippling of the rivers will not utterly despair of anything." ∇

Christopher Reed is this magazine's executive editor.

Photograph by Jim Harrison

Industrial Lives

Pay attention, students, to the human factor.



Professor Donald Davenport of the Harvard Business School hoped to teach the incipient captains of industry in his classroom, who tended to look on labor as a commodity, about the human factor in manufacturing. "I felt that if I could obtain photographs which reveal the courage, industry, and intelligence required of the American working man," he wrote, "perhaps our students could learn to look upon the working man with some degree of respect and sympathetic consideration."

In the 1930s, Davenport and colleague Frank Ayres wrote to leading businesses to request photographs for classroom instruction. They got more than 2,100 of them, from 115 companies. These images of men, women, and machines are today among more than 20,000 photographs at the school's Baker Library that record the growth of industry in the United States and in South and Central America. A multiyear effort by the staff of the historical collections to identify, catalog, preserve, and organize these visual records into collections has just ended, and, to celebrate, the library has mounted an exhibition of about 50 of those gathered by Davenport and Ayres. Curated by Melissa Banta, *The Human Factor: Introducing the Industrial Life Photograph Collection at Baker Library* may be seen there through March 7 and on-line at www.library.hbs.edu/hc/hf.

Big companies were eager to donate photographs to Harvard. They wanted to represent themselves as powerful industries with devoted workers and happy customers, to combat bad publicity from labor unions, and to make their employees feel valued. They were aided by superb photographers—Lewis Hine, Margaret Bourke-White, Russell Aikins, William Rittase, and scores now unknown—many of them influenced by the Cubist movement. Banta writes in the exhibition catalog, "Experimenting with light, composition, and composite photography, Machine Age photographers created elemental shapes and abstractions of industrial production that extolled the functional beauty of worker and machine."

Above: A worker in the gleaming world of the Continental Can Company's *Camden Plant,* circa 1936. Top, right: The futuristic form of a painter *Blasting Bodies to a Base,* circa 1933, at the Packard Motor Company. Right: *Trimming His Whiskers,* circa 1935. A goggled workman at Midvale Steel cleans up a 51,000-pound casting of a turbine casing. This image is by John Mudd; the other photographers are unknown.

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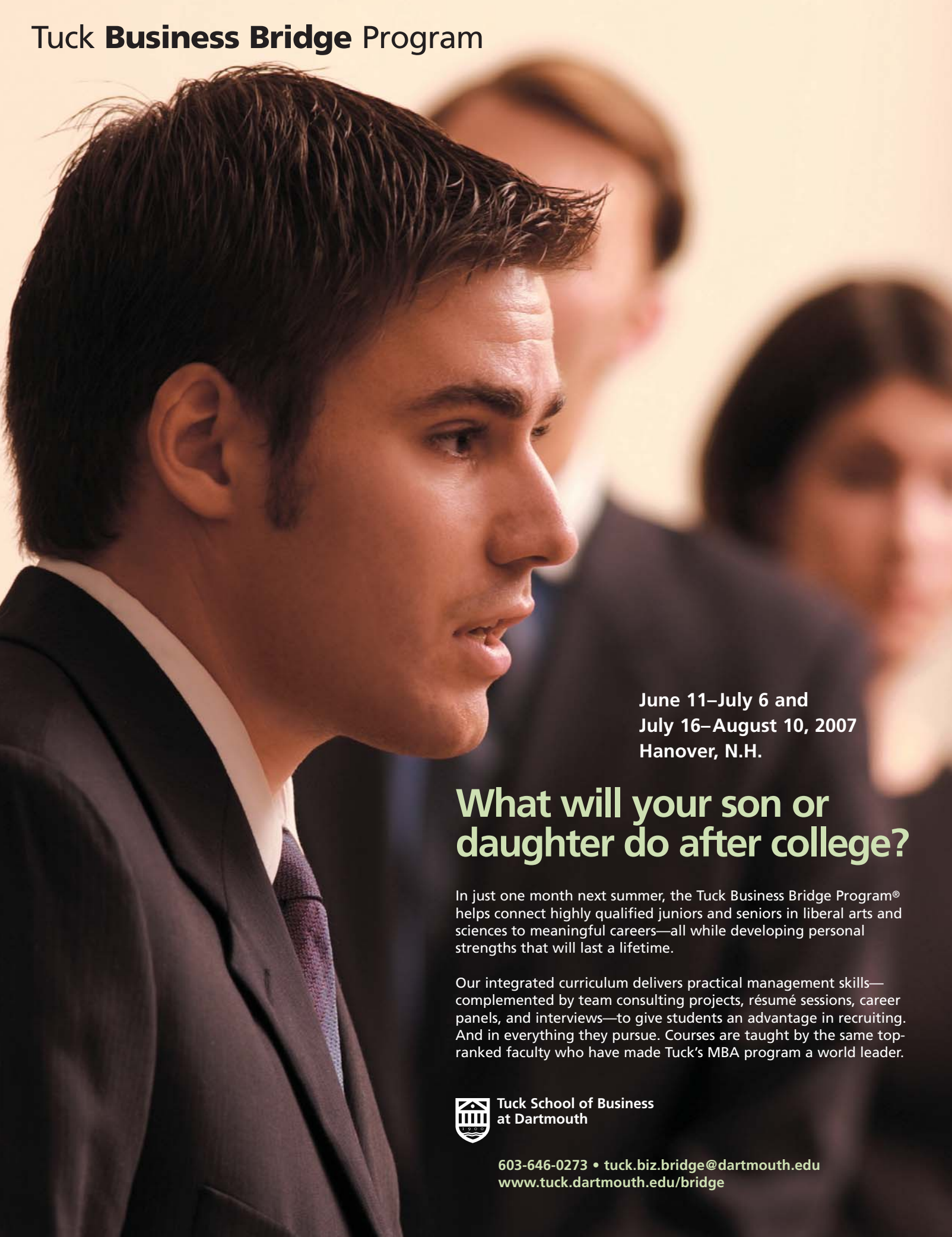

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